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The Fundamental Role of Standardization in the Operations of the Bell System[1]

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Use of standards for equipment, supplies, and practices, brings economies, greater efficiency and improved service

In connection with a comprehensive study of industrial standardization, the National Industrial Conference Board recently requested a description of the processes of standardization in the Bell System and the results obtained.

Such a description, of course, bears upon the activities of all parts of the Bell System and, therefore, a statement was prepared through the cooperation of representatives of the various general departments of the American Telephone and Telegraph Company, the Bell Telephone Laboratories, and the Western Electric Company.

With the permission of the National Industrial Conference Board, the substance of the paper thus prepared was published in the Bell Telephone Quarterly. This article has been brought up to date in this paper.

In view of the large number of people who assisted in the preparation of this statement it is hardly practicable to make specific acknowledgment to all contributors, but the undersigned, who acted as editor, wishes to acknowledge particularly the cooperation of Mr. S. P. Grace and Mr. R. L. Jones, Bell Telephone Laboratories; Mr. T. K. Stevenson and Mr. Fred Clark, Western Electric Company; and Mr. F. L. Rhodes, Development and Research Department, American Telephone and Telegraph Company.

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1

General Statement

The ideal and aim of the Bell System, as regards telephone service, is

> "A telephone service for the nation, so far as humanly possible, free from imperfections, errors or delays, and enabling at all times anyone anywhere to pick up a telephone and talk to anyone else anywhere else, clearly, quickly and at a reasonable cost."

[1] Presented before the September 10 meeting of the ASA Standards Council.

In order that it may most effectively work toward this ideal, the Bell System has been organized to do practically everything connected with giving such a telephone service, from the purchase of raw materials to the actual rendering of the service. Through the various companies and departments which constitute the System it does fundamental research work, investigates operating problems and develops operating methods, designs new apparatus to take advantage of the results of the research work and investigations, manufactures the apparatus in quantity, installs it as needed to meet service requirements, and operates and gives service with the plant so provided, using the methods so developed.

With this organization it is, of course, obvious that with far-sighted management the Bell System should seek to make the greatest possible use of standards for its plant and practices, and should seek also to have the number of different standards as small as is consistent with meeting adequately and conveniently the service requirements of its customers, in order to obtain the advantages in both service and economy which result. Standardization is, therefore, one of the firm bases on which the Bell System is built and is to a large extent responsible for the results which have been obtained.

Standardization in the Bell System is more than a means of obtaining economy and efficiency. It is essential to the best service and the most rapid progress. Standards are developed as the result of the accumulated experience of the operating companies and of the work of several thousand people at headquarters whose entire time is devoted to improvements. The results of the analysis of the operating experience and of the general investigations, researches, developments, and designs of the headquarters groups, crystallized in the form of operating practices, methods, types of apparatus and of communication systems, are made available at once to the operating telephone companies of the System

throughout the country, with information regarding their desirable field of use. These types of apparatus, communication systems, methods, and practices thereby become standards for the Bell System by virtue of the fact that they represent the outcome of adequate studies of the best way to meet a type of situation, and as such they are adopted by the operating companies and put into use to the extent that they are needed under the different conditions of different companies. In some cases the new standards as developed cover a new field of operating requirements or present the means for doing something which could not be done before. In many cases the new standards replace existing standards due to advances in the art, improvements in technique, or changes in operating requirements. Standardization is, therefore, not a static thing but is dynamic, involving a continuous procession of new standards to meet new conditions or to meet old conditions better than was heretofore possible, and the consequent dropping of old standards.

In the Bell System the standardizing functions are distributed through various companies and departments.

The headquarters' forces, consisting of the general departments of the American Telephone and Telegraph Company and the Bell Telephone Laboratories, are, as noted above, devoted to working out and standardizing improvements in telephone plant, methods, and operating practices covering the entire field of telephone work. This includes fundamental research work, the development, design, and specification of apparatus and of systems of communication, the development of standard methods of test, construction and maintenance practices, methods of handling telephone traffic, business methods, and provisions for safety and health.

The Western Electric Company, which manufactures, purchases, and distributes for the Bell System, is, of course, very much concerned with standardization. A great deal of its manufacturing work consists in the quantity production of standardized products, and this facilitates the use of standardized manufacturing processes. In the stocking and distribution of apparatus and materials, standardized methods have been highly developed. This is also true in the installation of central office equipment, which is largely carried out by the Western Electric Company.

The telephone plant throughout the country is operated by a group of 24 associated operating companies. Through the close cooperation between these companies and the headquarters' forces, full advantage is taken of their field experience in the determination and standardization of the best methods and practices in all matters bearing on the quality of the telephone service, including the design, construction, and operation of plant; business methods; and provisions for safety and for the health of employees.

To a large extent the standardizing work of the Bell System deals with matters peculiar to its own problems and is carried on within the System. The various parts of the Bell System are, however, taking very active part in cooperation with numerous national organizations engaged in standardizing work, in the development of standards which have a broader application than within the Bell System itself.

The various activities indicated in the foregoing are briefly discussed in the following pages.

2

Standardization in the Design of Telephone Plant

The nature of the telephone business is such that the telephone system offers a very good example of the advantages of standardization of plant and equipment. Telephone plant installed everywhere throughout the country must be such as to give satisfactory service when operated in connection with apparatus in any other part of the country. The plant of the telephone system is necessarily very complex in view of the complicated technical functions which it must successfully perform, the intricacy of the switching operations required for the rapid establishment of a connection between any two telephones in the country, and the complexity of the electrical transformations necessary to transmit and reproduce speech clearly between these telephones.

The complexity of the telephone plant and the number of types of apparatus and material which would be required would be very greatly multiplied if there were not a high degree of standardization for all parts of the telephone plant. In fact, it is not an exaggeration to say that the telephone service of today could not be given without this high degree of standardization and simplification.

As a result of standardization, the telephone plant includes very large numbers of identical units of apparatus. This, of course, has numerous advantages. The use of very large numbers of standard types of apparatus, circuits, and equipment results in large economies in production. For example, about 1,500,000 receivers and 1,500,000 telephone transmitters, each of a single type, are produced during a normal year. Also, about 2,500,000 relays of the "E" type, differing only in the details of assembly of standard piece parts, are usually produced annually, and of these about 239,000 are of one code number and 232,000 of another code number, the relays of a given code number being identical.

Without standardization these same quantities would be distributed between a large number of different types with correspondingly greater costs. The advantages of using in the telephone plant large numbers of identical pieces of apparatus, of course, extend beyond production and include stocking, construction, maintenance, and operation.

In all standardization of apparatus, interchangeability has always been a prime consideration. This is important from the standpoint of dimensions; for example, transmitters are so designed as to fit into any mounting even though made a good many years apart. In a broader sense, considerations of interchangeability lead to the design of new standards in such a way as to fit into existing plant with the minimum possible change in the other items of the plant. This is of great importance, for example, in the design of new circuits which must function properly with existing telephone plant both in the transmission of speech and in the operation of signals associated with the switching equipment.

In view of the large degree of standardization of the present telephone plant, the standardization work does not consist primarily in the simplification of present practices but to a large extent in the development of new standard apparatus or materials to replace or supplement existing standards.

These new standards may have their origin in the development of new operating requirements or conditions, which are continuously reviewed by the studies of the general departments of the American Telephone and Telegraph Company in cooperation with the operating companies. An illustration of this type of origin is given by dial switching equipment for very large cities, the development of which was undertaken as the result of fundamental studies showing that the conditions in large cities are becoming progressively less favorable to manual and more favorable to dial operation.

Or the new standards may develop from an invention or a group of inventions. An example of this is a group of inventions bearing on the increase in range of telephone transmission, which opened the way to the clear transmission of speech over very long cable circuits free from interruption by storm, whereas previously the voice transmission was possible through cable only over relatively short distances. This is resulting in the rapid development of a nationwide system of toll cables to a large extent replacing for new work the previous types of toll circuits.

Again the new standards may arise from the results of fundamental research work making possible new kinds of apparatus or developing new types of materials as illustrated by the development of permalloy, a new alloy having very extraordinary magnetic properties. This new material has been applied in the design of inductance coils and of relays which can thus be made with a relatively small amount of magnetic material giving lower cost or with improved operating characteristics.

In any of these cases standardization is the final step in the process of development which is carried out by the headquarters departments, including the general departments of the American Telephone and Telegraph Company and the Bell Telephone Laboratories. The development is based upon studies of the needs of the operating companies and investigations of the possibilities of new inventions, and it results in the complete specification of the new type of apparatus or system of communication designed to best meet the end in view.

The proposed new standards are not only carefully scrutinized as to design but are given extensive laboratory tests, and most often, in addition, trials under actual service conditions before being standardized. With satisfactory results from these trials the apparatus is standardized by the American Telephone and Telegraph Company and general information regarding it and its field of use is issued to all of the associated companies. The new standard is thereupon adopted by each associated company for use to the extent that conditions in its territory present a proper field for its use.

Concurrent with the standardization of the new type of apparatus, the Bell Telephone Laboratories provide to the Western Electric Company standard specifications covering the description and performance of the apparatus, including manufacturing tests and inspections. It is the purpose of these specifications to give adequate information to the manufacturer regarding the device and regarding the performance requirements which it must meet when completed, but not to specify in detail the process of manufacture. This is done by the manufacturing organization itself, which standardizes for each type of apparatus the methods to be followed in its production.

A great deal of attention has been given to the design of apparatus in such a way that a single piece part can be used in a large number of different apparatus units. By this means, engineering and production costs are greatly reduced through the reduction in the number of parts and the resulting large quantity production of as few standardized parts as possible.

One interesting example of this standardization of piece parts is in connection with keys; that is, hand operated switches. Keys are used in connection with telephone switchboards in large quantities and are required to perform a very wide variety of switching functions. This leads to the necessity for a large number of dif-

ferent types of keys. However, these keys have been so designed that certain parts are used interchangeably in many different types of keys. Be-

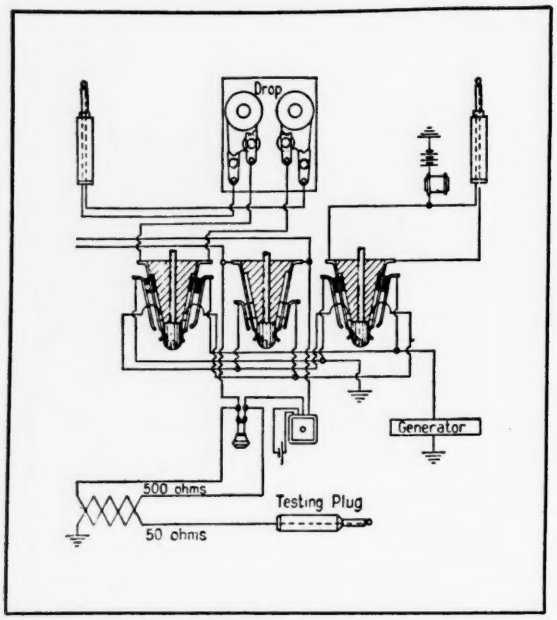

FIG. 1

A Drawing of a Simple Cord Circuit Made in 1889

cause of this fact, production of such parts is very high and the keys themselves can be manufactured on an economical basis even though the demand for some particular combinations of parts may be small. A similar illustration is given in the design of relays, which are electrically operated switches.

A great deal has been accomplished in the standardization of the technical information about new apparatus standards. Drawings, for example, covering standardized equipment or apparatus are made up in standard size and form. It has been found that 13 sizes are sufficient to meet the requirements of all but the most unusual situations.

Not only are the drawings standard in size and form, but also it is found possible to use identically the same drawing in different parts of the organization, thus avoiding duplication of effort. Drawings covering the design of new apparatus made up by the Laboratories are sent to the Western Electric Company or other manufacturers involved and, where applicable, used by them for manufacture. These same drawings are furnished to the associated companies to inform them of the newly standardized apparatus and used by these companies in their technical work.

In connection with the standard drawings very large savings are made by the use of standard symbols representing pieces of telephone apparatus. These symbols are arranged in a drafting dictionary, known as the *Circuit Convention Handbook*, which is used by draftsmen and engineers in preparing circuit drawings. It contains conventional diagrams for all the standard types of apparatus now in use. Each of the conventions, of which there are thousands, is made up to indicate the essential functions of the piece of equipment as it affects the circuits, without showing the mechanics of the design of the apparatus involved. It also covers the abbreviations which are normally used on circuit drawings.

As an example of the effect of standardization in this particular, Figures 1 and 2 are of interest. Figure 1 is a drawing of a simple cord circuit made in 1889. Figure 2 shows how the drawing of the same circuit would be made today. The great reduction in labor of drafting and much greater ease of interpretation of the drawing are evident.

Of the above conventions those which are in general use by all telephone manufacturers are in process of approval by the American Standards Association as American Standards, thus assuring uniformity of these conventions, not only within the Bell System but among telephone manufacturers outside the System as well.

The general plan outlined above for drawings is also used for the distribution of specifications for equipment design. Specifications prepared by the headquarters' forces are distributed to both the manufacturing and the operating

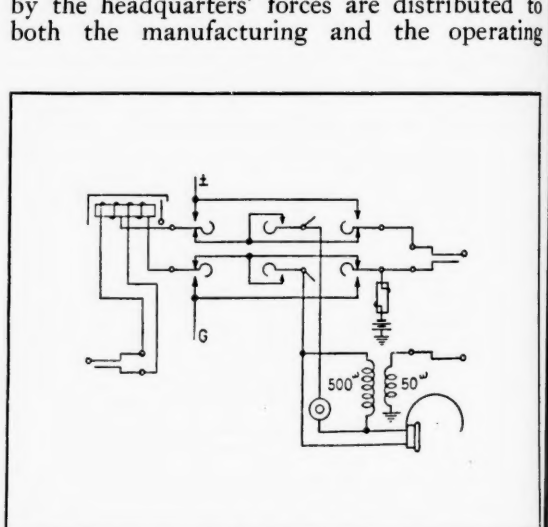

FIG. 2

How the Drawing Shown in Fig. 1 Would Be Made Today

branches of the organization. These specifications are made uniform in style and size to facilitate their use and their filing.

3

Specific Examples of Standardization of Telephone Plant

It is, of course, impracticable within a limited space to indicate all of the important items of standardization in the telephone plant. However, in addition to the illustrations used in connection with the foregoing general discussion, a few of the most outstanding results are briefly outlined below.

In local manual switchboard equipments, it is found possible to meet the widely varied demands of the Bell System with only five standard types of switchboard, three designed for common battery offices and two for magneto offices. This means that while the actual amounts of equipment required naturally vary with the size and local conditions of the office, the switchboard in each case can be made up of assemblies of standard units corresponding to one of these five standard types.

In dial equipment the standardization is still greater. Here again there must, of course, be differences in the amount of equipment in different offices and also differences in certain items of the equipment. Beyond this, however, there are in use in the Bell System essentially only two different types of dial machine equipment. One, the panel type, is designed to meet the requirements of the larger cities, each of which has a relatively large number of offices which must be interconnected by means of the dial equipment. The other type of equipment, the step-by-step, is designed for use in the smaller cities and towns where a single office or a relatively small number of offices is adequate to provide present and prospective telephone service.

In the past there have been made for general use for subscribers only one type of receiver and one type of transmitter, although a small number of additional types have been made for a fraction of a per cent of special cases. These instruments, combined with associated ringing and auxiliary equipment, form telephone sets, some of which are desk stands and some of which are wall sets. It is found, however, that the needs of the country can be supplied with only 23 types of sets, including both those for use with dial and those for use with manual switching equipments, and including the arrangements necessitated by different types of service, as individual line, two party, four party, coin box, etc. During transition periods such as we are involved in at the present time where the hand telephone set is coming into general use and a new subscriber's circuit involving sidetone balance is to be employed, a temporary increase in the number of standard types of sets is necessary, but in a few years about the same number of sets should adequately take care of the needs of the country.

In the installation of telephone sets on subscribers' premises, numerous requests are received for wiring plans by which telephones may be switched from one line to another, special ringing arrangements may be provided, and extension stations may be associated with the line. The extent to which simplification in practice may be advantageous is illustrated by the results from a single operating company of a review some time ago of their wiring plans. In this one company it was found that whereas 540 different plans were in use, the requirements could be met by 28 standard plans, and of these 28, 16 took care of all but a few exceptional cases.

In the preservative treatment of poles, while a very large number of types of treatment have been experimented with, two types have been standardized for general use. One is an over-all treatment for pine poles, which require treatment for the parts exposed to the air as well as for the parts in the ground. The other is a single type of butt treatment for other woods of such a nature that preservative treatment of only the part of the pole which is in the ground is adequate.

With the exception of a few special cases, the requirements of the Bell System are met by two types of standard cross-arms, one designed for poles carrying only telephone circuits and the other designed for poles carrying both telephone circuits and conductors of other wire-using companies.

A large percentage of the conductors in the telephone system are in cables placed in underground conduit. It is found that approximately 90 per cent of the conduit is properly covered by six different types of vitrified clay, differing only in the numbers of ducts which constitute the unit.

There has been a high degree of standardization of the sizes of copper wire used for telephone conductors. Ninety-seven per cent of the open wire (that is, wire strung on insulators) added to the plant at the present time is made up of three sizes, respectively, 104, 128, and 165 mils in diameter. Insulated wires in cables are also selected from a limited number of gages. For example, long toll cables are made up practically entirely of two gages, 16 and 19 B. & S. gage. The cables for local distribution circuits are more than half of a single gage, 24 B. & S., and about 95 per cent are of one of three gages, 24, 22, and 19 B. & S.

It has been possible to do a great deal in developing standards covering the best methods for the design and layout of telephone plant. A good example of this is given in the layout and arrangement of telephone apparatus in central offices. It is necessary each year to build about 200 telephone buildings to house additional

equipment. These buildings are planned to provide at reasonable cost for both the present and future service needs, and the greatest care and thought are given to the design of each specific building to make it attractive and outstanding and a contribution to the ideals of the community in which it is erected. At the same time the general plan can in most cases be adapted to one of a limited number of standard arrangements. This makes possible the use of standard assembled equipment units, of standard detailed floor plans, and equipment engineering specifications, and leads to economy and speed of construction. It also insures that carefully worked-out arrangements, designed to give best operating results and provide greatest flexibility for future growth, are used for all cases in which they are suitable.

Another example of this type of standardization is presented by toll circuits. If each toll circuit were designed individually to meet exactly the requirements as regards efficiency for good transmission in the particular case, the result would be that in general each small group of toll circuits between two points would differ in design from every other group of toll circuits between any other two points. This would result in tens of thousands of different kinds of toll facilities, each designed for a specific use only, and would result in endless confusion and lack of practicability. Instead of following this plan, the types of toll circuit for new construction are limited to a very small number including only three types for open wire circuits and from four to six types for toll cable circuits. In the design of any given circuit choice is made from this limited number of types of facilities, selecting one which, combined with suitable apparatus, will give not less than the required transmission efficiency in the given case. This results in great advantages in simplicity of plant design and in the flexibility with which facilities can be transferred from one use to another as occasion requires.

Other specific examples could be given but the above are sufficient to indicate the very important part which standardization plays in the design of telephone plant.

4
Standardization of Raw Materials

The production of standard products naturally requires the standardization of the raw materials entering into those products. There have, therefore, been developed a series of specifications covering the standard requirements for raw materials purchased for the construction of telephone apparatus and also covering standard finishes for these materials as fabricated by the supplier.

An important example of the establishment of standards for raw material is the establishment of requirements for sheet brass of all tempers and thicknesses. This work has been extended to include nickel silvers and bronze, covering altogether seven grades of metal. Work has recently been started on cold heading wire. All of this work is carried on cooperatively between Bell Laboratories, the Western Electric Company, and the principal suppliers of raw material.

Standard requirements for materials, of course, depend upon the establishment of suitable standard methods of test to measure the quantities which are to be specified. The American Society for Testing Materials has done a very large amount of work in developing standard tests for materials and it has been the practice to adopt these standards of test whenever they serve the purpose. As a result, a large majority of the specifications for raw material contain reference to A.S.T.M. testing methods.

In addition, however, it has been necessary to take a very considerable amount of initiative in the development of standard testing methods. Wherever practicable this work has been done in cooperation with the A.S.T.M. and other interested organizations.

The question of hardness testing was given considerable study in connection with the work on brass and this has resulted in the adoption of standard tests for the Bell System which have been accepted by the appropriate A.S.T.M. Committees, and will probably be adopted by the Society. Impact tests suitable for molded and sheet insulating materials have also been developed. Another interesting development is that of suitable tests for die castings, including tensile strength, elongation, hardness, and impact strength. In developing standard methods of test for die castings, more than 100,000 specimens have been prepared to date and tested by the cooperating organizations.

Other standard methods of test developed through the Bell System, which are of interest, are insulation resistance tests, high frequency tests, and tests of insulating papers. In these tests and in others, the Bell System representatives have cooperated with the A.S.T.M. and they have adopted as standard the methods developed.

The discussion of raw materials is a natural place in which to mention the standardization of methods of sampling, although this applies to completed products as well as to raw materials. In many cases it is practicable to make the tests for the check of quality on only a fraction of the material supplied. In order to insure uniform and satisfactory results, it is necessary to have standard methods of sampling including the determination of the size of the sample lots to be tested and the interpretation of the results of

those tests as applying to the material as a whole.

5

Standardization of Manufacturing Plant, Equipment, and Processes

In the Manufacturing Department standardization of manufacturing processes is closely related to standardization of the factory buildings themselves, their fixtures, such as heating and ventilating systems, and general manufacturing equipment. The cost of designing and erecting structures, whether required in new locations or as additions to existing plant facilities, has been reduced to a minimum by predetermining building unit designs adapted to specific manufacturing requirements, the units being increased in number as requirements demand.

Many years ago a standard building width was adopted which made possible an economizing of building space permitting the use of machinery, benches, racks, etc., with dimensions most suitable for installation in the building. The productivity of a fixed investment in buildings has been increased, and an important economy in the cost of installation of their equipment has been realized.

In the design of buildings for the new manufacturing plant at Kearny, New Jersey, a uniform column spacing is maintained throughout all multi-story buildings. A great many advantages relating to occupancy have been realized from this standardization. An example is a reduction in cost of approximately 50 per cent in constructing and erecting metal partitions. Uniform column spacing made it possible to design partition panels of a standard width which is an even fraction of the spacing of columns. This eliminated the necessity of making drawings of each partition installed, as it is sufficient to indicate on the standard floor plans the position of each panel. The cost of constructing and erecting partitions has been reduced by increasing the proportion of construction work which may be performed in the machine shop in larger lots and by economical methods and suitable equipment, rather than in the field where adequate facilities are not available.

It is the responsibility of one organization within the Manufacturing Department to see that all new machinery is in accordance with established standards, or to recommend new standards for new conditions. In some specific cases where another type of machine will be more economical for some heavy running part, it is desirable to depart from these standards. There are many advantages incident to having a standard type machine for each class of work: lower first cost because of volume buying, ease in applying standard safety measures, adaptability to standardized processes, adaptability for use with standardized associated equipment, such as benches and trucks, flexibility of the machine equipment to meet peak loads and interchangeability of machine parts, which reduces the cost of maintenance.

Not only the machines themselves but their associated parts, such as bearings, clutches, hand wheels, control levers, mountings for electrical apparatus and lubrication systems, are standardized. As far as possible these standards are applied to the machines purchased as well as to those made in the shops.

Manufacturing fixtures such as shop benches, lockers, racks, trunks, etc., have been standardized and the advantages of such standardization appear daily in the manufacturing work. In preparing arrangements of office and shop departments, as the dimensions of each item to be installed are known in advance its position may be fixed without requiring its measurement in each instance. This not only reduces the cost of fitting manufacturing equipment in the space allotted to it, but also makes possible floor space conservation by the best arrangement of equipment, and important economies later in its operation by providing for the convenience of the workmen. Standardization of these items has had the usual effect of reducing the cost of their manufacture by making possible quantity production of a small number of items, rather than small quantity manufacture of a large number of items.

Considerable benefit has been derived from the standardization of tools and gages and design practices. Standard and typical drawings have been made for various types of punches and dies, drill jigs, fixtures, and other classes of tools. Parts such as drill bushings, latches, gage pins, jig feet, clamping cams, punch and die holders, line guide and dowel pins, stops, springs, die blanks, etc., have been standardized. Many of the different sizes of these parts have been replaced by common sizes reducing the sizes stocked to a small per cent of the original. This, and standardization of design, greatly reduced the raw materials necessary to be carried, and in most cases replaced the practice of making parts as required for each tool by the more economical one of producing these parts in quantity lots of few types, to be stocked and drawn for use as required.

Tool steels have been classified and assigned code numbers, and a table lists the proper steels to be used for standard and common types of tools and parts. Tools and parts purchased from suppliers have been standardized and stocked to avoid duplication, insure interchangeability, facilitate replacement and repair, and secure the advantage of quantity purchasing.

Standardization has simplified and reduced

the cost of design work, and has also secured better uniformity and more economy of design, considering manufacture, operation, and maintenance. It has permitted the manufacture of standard parts on a quantity production basis with its resulting economy, and, due to the selection of available standard designs, has facilitated the adoption of standard methods in building of tools to reduce their cost.

As an example of the results of standardization in tool making, when an open compound punch and die of a relatively common type is required, the only design work necessary is to lay out the special die form and to specify by code number the standard parts to be drawn from stock to be assembled in the tool. The majority of these are usually available. The special parts will be made and assembled with the stock items to complete the tool. It is estimated that a tool made by these standards will result in a saving of one-third on the average over the cost of producing the same tool by making drawings of each part individually and producing all of the parts at the time the tool was built. This percentage will, of course, vary considerably depending on the type and complexity of the tool and the extent to which standards may be applied.

The manufacturing processes for all material made in large quantities in the Western Electric Company are covered by operating instructions or "manufacturing layouts." A planning organization originates these manufacturing layouts, directing the employment of processes and equipment that have been carefully standardized to give the highest quality of product and to be most economical of time and material.

Many of the processes that are specified in the manufacturing layouts are covered by process standards. This enables the planning organization merely to specify the proper standard, without going into the detailed description of the process to be followed. For example, wood finishes are covered by standards that specify all of the materials to be used, such as varnishes, shellacs, sandpapers, and rubbing compounds, and give the drying periods. These standards are accompanied by samples of the finish that is to be matched.

Another example is found in the standardization of methods to be used in the carrying out of chemical processes, such as electroplating. In this case the process standard specifies the density of the electrolyte, the temperature, the current intensity, etc.

Heat-treating processes are similarly covered by standards so that when a new product is to be made, it is merely necessary to specify the standard in accordance with which it is to be heat treated.

The use of standards of this kind not only simplifies the work of making the manufacturing layouts, but it also simplifies the introduction of the manufacture of new products in the shop, as the operating people are already acquainted with these standard processes and have the necessary materials and equipment already available.

6

Standardization in Distribution and Installation

In distributing and installing apparatus and equipment, the standardization of methods, tools, and materials is also of great importance.

When the thousands of orders transmitted to the Electric Company for execution and the large number of sources from which these originate are considered, the value of standardized methods of ordering is apparent. Standard requisition forms originating with the telephone companies convey the orders, along with necessary shipping instructions, to the distributing houses of the manufacturer. To facilitate the handling of orders for complicated assemblies of equipment, such as complete central office equipments or large long-distance offices, a series of ordering questionnaires has been developed. These questionnaires, accompanied by necessary building plans and other drawings, provide in an orderly sequence all the data necessary to acquaint the equipment engineers with the detailed requirements of the project; they are designed to suggest the use of standard equipment and arrangements wherever possible.

When such an order requiring engineering work by the Western Electric Company reaches one of its factories, the Equipment Engineering Department translates the telephone companies' requirements into manufacturing specifications and drawings utilizing standard equipment specifications and drawings on 80 to 90 per cent of all orders for central office equipment units, such as switchboards, desks, and the mechanical units for dial offices. This results in standardizing the information which goes to the Manufacturing, Installing, and Pricing Departments, and minimizes the effort required to engineer, manufacture, test, install, and price the equipment.

Even when supplementary equipment is required to meet certain local conditions and is not suitable for standardization, the method of preparing the manufacturing specifications is standardized through the use of standard equipment engineering specification forms, which list the standard editing information for a particular unit of equipment and leave the quantities to be filled in by the engineers. This not only reduces the engineering effort, but also maintains uniformity in arrangement and sequence of the information in the specifications, thereby adding

greatly to the convenience with which such specifications may be used by other organizations.

An important advantage of equipment standardization is that it permits the resultant standardized units to be stocked or otherwise made available on a short delivery basis.

By stocking standard units the delivery intervals on certain types of central office and private branch exchange equipment have been greatly reduced in the past few years. For example, the delivery interval for certain private branch exchange equipments was reduced from six months to one month. Furthermore, a great many special features have been dispensed with which were formerly thought necessary when equipment was ordered on a custom-built basis, and because of the much smaller variety, production authorizations may now be placed on the Manufacturing Departments in larger quantities or on an even-flow basis so that progressive assembly methods may be applied which result in lower over-all engineering and manufacturing costs.

As an aid in establishing and maintaining standard equipment designs and in giving such standards necessary publicity with the telephone companies, the manufacturer's standard specifications, stock lists, catalogues, and price lists are published and distributed to the customers.

These plans do not retard the work of the development engineers in effecting improvements in design. Improvements and changes, however, are made on an annual basis unless the advantage of the improvement makes it expedient to introduce it at once. This facilitates the introduction of new designs and minimizes the effect on stocks and schedules.

In the case of central office and toll equipment especially, it is usually the function of the Western Electric Company to erect or install the equipment and to deliver it to the customer as a complete operating unit. Standard methods for planning, estimating, and performing the installation work have been established and are prescribed for the guidance of installation crews working in all parts of the country. All necessary tools, fixtures, gages, and testing devices are covered by standard designs, and these standards are specified for use wherever they apply. Such things as scaffolding, temporary lighting, storerooms, and job office equipment are also standardized.

The standardization of apparatus greatly facilitates the standardization of packing methods and shipping containers.

The thousands of different items which must be packed and shipped by the Western Electric Company makes the packing problem an extremely important one. In developing standards of packing, consideration has to be given not only to the first cost of containers and packing material but also to the serviceability of the package from the standpoint of withstanding abuse in transit, to the convenience with which it may be handled and stored in the Western Electric Company's warehouses and in the telephone companies' storerooms, and even, in the case of subscriber's station equipment, to the convenience with which the package may be finally distributed to the subscriber's premises.

When a new method of packing, or a new type of container, has proved to be better for a certain item than an existing method, or container, its application to other items is immediately considered; however, every effort is made to keep the variety of sizes and shapes of containers at a reasonable minimum.

To assure uniform methods where products are packed at more than one location and to preserve the standard designs, specifications and drawings covering the method and designs are prepared and accumulated in a packing manual.

Standard methods instructions are distributed to the installers in the form of handbooks. Catalogues of standard tools and supplies, giving information as to how and where each item may be obtained are also supplied to the men. The sequence in which apparatus and material can best be used by the installers has been studied and standard shipping schedules are prescribed to insure that the work may proceed in an orderly manner.

Before a completed equipment is turned over to the telephone company certain standard final tests are applied by the installers to assure its satisfactory performance. This insures that a certain circuit will be tested in the same manner and must meet the same requirements whether installed in New York or on the Pacific Coast.

The procedure and methods for making tests and the testing equipment have been standardized to conform to the standard tests. A number of standard sizes and types of test set containers have also been adopted.

7
Standardization in Relation to Operation

As a part of the work of the General Departments, the best methods for the construction of telephone plant are worked out, taking account of the experience of all of the operating companies. These methods are presented in the form of construction handbooks, which are made available to all of the operating companies through a common source in order to get the advantage of quantity production.

The standard construction practices are based upon the use all over the country of standard types of construction material. This standardization of materials makes it possible for the purchasing organization to buy very large quan-

tities of a relatively small number of types of material with resultant large savings in cost. Also with shifting of needs men engaged in construction work can transfer easily from one part of the System to another. It is common practice, in cases of emergency due to large storm damage or other causes, to concentrate temporarily in one small area construction gangs from a number of different operating companies. These men have no difficulty with the work in a new area because of the uniform construction practices in use throughout the country. Furthermore, in severe storm emergencies the fact that the material needed has been standardized makes it possible to obtain it quickly in great quantities from the many points where it is stocked throughout the country.

The maintenance practices are standardized in ways similar to those discussed for the construction practices. Bell System maintenance practices are prepared by the general departments, making use of the maintenance experiences of the operating companies and of general investigations of the relative advantages of different practices and methods. These standard practices are printed in quantity and are ordered by the various companies for use as required. In addition to the advantages discussed above for uniform construction practices, there is a further advantage, important from the standpoint of toll service, that men at widely separated points and employed by different companies are using the same practices for the maintenance of telephone circuits and equipment. These men can, therefore, deal with each other at long range effectively without misunderstanding because of their common background of methods and materials.

It is, perhaps, in considering traffic operating practices that the advantages, and, indeed, the necessity of standardization in relation to operation, are most evident in the Bell System. The telephone subscriber has the right to expect the same sort of operating practices in the various cities of the country so that he may use the telephone with a maximum of convenience. In toll calls the operators must constantly deal with other operators in distant cities and employed by different companies, and it is obviously essential that the operating practices should be alike in order to avoid difficulties.

Standard operating practices are developed by the general departments as a result of their studies and investigations, and taking advantage also of the actual operating experience of the companies. These standard operating practices are used for handling all types of calls with the various types of standard equipment. The practices cover local exchange service in all of its forms, such as flat rate, message rate, coin box, individual or party line service, etc., and also toll and long-distance service. They also cover information service and other auxiliary services for calls requiring special treatment.

The practices specify in detail the procedure to be followed by operators in handling these various types of calls, and in general specify also the phraseology to be used by the operators, with a view to insuring maximum accuracy, clearness, and convenience to the subscribers.

As operators are constantly entering and leaving the service, it is necessary to carry on continuously schools for the training of new operators. Each associated company maintains a Training Department and the methods and equipment used in this training work have been standardized throughout the entire country.

An interesting illustration of the standardization of operating practices is given by the procedure known as the "Service Order Routine" for establishing new or changing existing telephone service. These operations require the coordinated effort of all operating departments of the telephone company, including arrangements for installing subscribers' station apparatus and wiring, the placing of outside wires, the interconnection of apparatus in the telephone central offices and proper designation of the new line at the telephone switchboard, proper tests of completed circuits, arrangements for commencing the furnishing of the traffic service, and arrangements for proper billing and entry in the directory and for the advice of information operators. Extensive studies have developed general plans for accomplishing this somewhat complicated service function in the best possible way in a minimum of time and with maximum insurance that all the necessary steps will be taken without confusion. On the basis of these general plans each operating company develops a specific detailed Service Order Routine which is made standard for that company.

8

Standardization of Business Methods

A very valuable type of standardization which may be classed under the heading of "business methods" is the standardization of non-technical supplies, particularly of office supplies and furniture. In a normal year, purchases of the Bell System companies in this line exceed $5,000,000 per year and appreciable savings have been derived by the standardization of these supplies. In addition to the savings, such standardization has resulted in the provision of supplies better suited to company requirements through the analysis by trained specialists, in the determination of the best methods of handling supplies to promote efficiency and reduce waste, and in supervision of the quality of the supplies purchased.

The effect in reduction of costs can be illustrated by the single item of black lead pencils, the purchase of which on an average amounts at the present time to more than $150,000 a year. Prior to standardization 55 different brands were in actual use, while at the present time only three types are used, these providing a range of quality, with one of these grades covering 93 per cent of all requirements. The saving from standardization of black lead pencils is estimated at $50,000 per year.

Another interesting phase of this work has been the investigation of all clerical labor-saving machines, the development of machines best adapted to the needs of the telephone business, and the standardization and use of the types found most advantageous.

In a business as complicated and as widespread geographically as the Bell Telephone System it is highly essential, in order that System reports may reflect accurately the results throughout the country, that a uniform classification of accounts be followed throughout. The accounts of the telephone companies in the Bell System have been standardized in accordance with those prescribed by the Interstate Commerce Commission, with certain amplifications which render them more effective for Bell telephone accounting practice and do not impair the integrity of the accounts prescribed. This makes it possible not only to summarize the growth and operation of the System as a whole but also to make significant comparisons of the results achieved by the various operating areas. Without such a system of uniform accounting, the unified and economical operation of the Bell System operating properties would be very greatly hampered.

Accounting practices and methods are studied continuously by specialists in the General Staff organization and improvements in standards which are developed are generally adopted by all the operating companies. Included in the detailed accounting practices which are generally standardized for the Bell System are such items as cost accounting, payroll and vouchering methods, administrative reports and budgetary control methods, inventory control methods and schedules, auditing methods, application of mechanical devices to accounting work, and many other similar matters which lend themselves to standardization resulting in increased economies and efficiency.

One of the routine accounting jobs which lends itself to standardization is that of keeping the accounts of customers and rendering bills for service. The value of standardization for this routine work is readily seen in that, in the Bell System, accounts are kept with approximately 11,000,000 customers and more than 125,000,000 bills for exchange service are rendered each year. More than one billion and a quarter charge tickets are handled annually in order that charges for service may be properly made against telephone users. Nine hundred million of these charge tickets are for toll service, of which 750,000,000 must be entered separately on approximately 71,000,000 toll service statements.

For the keeping of accounts there has been developed and made standard what is known as the "accounting stub plan." In this plan, stubs which form a part of the bills are detached when bills are mailed and take the place of ledger or card records of the accounts.

For many years the preparation of bills and statements as to name, address, and exchange service charges has been facilitated by the use of standard addressing equipment.

Rendering such a vast number of bills on a monthly basis brought about a very uneven distribution of work with a peak load at the beginning of each month, and to overcome this difficulty what is known as "rotation billing" was introduced. Under this plan each accounting office divides its accounts into six groups and for each group bills are rendered at different dates at five-day intervals during the month. This permits of spreading the load over the entire month.

Along with the improvements in the practices referred to there has been a continuous development of machinery and other labor-saving devices in connection with rendering customers' bills. To enter 750,000,000 toll charge tickets on approximately 71,000,000 toll service statements presented a most fertile field for the realization of economy through the development and standardization of mechanical devices. A standard form of statement for toll billing was developed and studies were made in conjunction with leading manufacturers of typewriters for devising a billing machine of special construction adapted to this particular work. After the machine was developed and exhaustively tested under careful observation it was made standard for Bell System use and has been adopted by all of the companies.

The standardization of practices, particularly the two referred to as "accounting stub plan" and "rotation billing plan," has made possible and practicable the standardization of specially constructed mechanical equipment (in addition to the toll-billing typewriter referred to above) for the preparation of customers' bills which has been recommended for Bell System use. This equipment eliminates all handwriting from customers' bills and produces a more accurate bill than was possible under any other plan, together with improved general appearance of bills. None of these standardized billing practices imposes unnecessary restrictions or complications upon the employees in the handling of business affairs with customers. Exception practices are provided so that the wishes of a customer desir-

ing to be billed in a manner different from the standard or at other than prescribed billing periods may be given due consideration.

Telephone directories have offered an important field for standardization in spite of the fact that no two directories are entirely alike. The paper and cover stock used are standardized and purchased centrally through the Western Electric Company and manufactured in accordance with specifications and the supply checked continuously for quality. The general arrangement of material in the book is standard, standard alphabeting rules are followed in listing names, standard page sizes used, standard sizes of space offered for advertising and standard types used in printing. In the clerical work of compilation, standard practices are followed. From this standardization have resulted not only a uniformity in appearance and ease of reference, but large economies in compilation and manufacturing cost. It is estimated that without the standardization of directory paper and the bulk purchasing which this permits, the same quality of paper would cost the Bell System about $800,000 more per year.

9

Standard Provisions for Safety and Health

The plant of the Bell System is constructed to conform to definite standards as regards strength of construction. In the formulation of these standards, consideration is given to the safety of the employees and the public, as well as to the continuity of service.

The question of safety is most important in cases where other wire lines or railroads also are involved. Standard requirements regarding type and strength of construction have been established for all such cases in cooperation with the other utilities involved. Many of these requirements are set forth in the National Electrical Safety Code. Experience shows that such construction standards greatly increase the safety of workers on telephone lines.

Safety is considered not only in the initial construction but also in the standard provisions for routine maintenance which call for maintaining suitable margins of strength in plant which is in proximity to other wire lines.

Very definite provisions have been made for protecting the public, the employees, and property against electrical hazards. As a result of cooperation between the power and telephone companies, standard provisions have been adopted to reduce the chance of power voltages or currents being introduced into any part of the telephone plant. These rules specify standards of strength and of separation, and the relative location of pole lines, wires, and outside equipment when placed on the same poles, or in proximity.

Supplementing these precautions as regards power circuits, and as a provision against damage due to lightning, standard installations of protective apparatus are provided for subscribers' and central office equipment and for cables when the wires are exposed to these hazards. The use of standard arrangements throughout the country insures a uniform, high degree of safety to the users of the telephone plant.

Protection against fire is, of course, a very important consideration, particularly in the planning of buildings. Next to the safety of personnel, continuity of service is a main objective. All telephone buildings, except for certain small offices, are made fire resistive, the construction conforming to the standards of the National Board of Fire Underwriters for fire resistive buildings. The most approved fire resistive devices are used, such as metal and wire-glass windows, hollow steel doors, extra strong partitions enclosing shafts and exits, and rolling steel shutters for openings facing hazardous exposures. In addition, very complete fire-fighting appliances are provided in all buildings. Additional methods and devices are adopted by the companies in accordance with the recommendations of the underwriters and as the result of investigations carried out by the headquarters' departments.

Standard equipment has been developed for both outside construction forces and manufacturing forces with a view to safety as well as efficiency. These developments include such things as linemen's safety straps, standard goggles for protection from dust and others for protection from heat, etc.

In the factories, standardized methods of safeguarding machines have been adopted that make it simple to guard new equipment and furnish a criterion for determining whether or not equipment is properly guarded. Because these standards have been tried in other installations, it can be confidently concluded that guards made in accordance with their requirements will not fail to afford maximum protection. Without such standards it would be necessary to design guards individually for each installation, with the danger that the use of untried designs might result in unforeseen accident hazards. Standardized practices are followed in the provision of ventilators and dust removing devices, resulting in assured safety to the workers and in reduced cost of design.

A great deal of attention has been given to the development of standard safety provisions for the outside construction forces. In this standardization, groups of construction employees directly involved play an outstanding part. This procedure has the great advantage

of developing the initiative and judgment of the employees themselves who are, in the last analysis, directly responsible for the effectiveness and use of any safety standards adopted. The results of studies of these groups with the cooperation of representatives of the general departments are issued as safety codes adopted as standard by each of the operating companies.

In view of the importance of these standards to all employees, various methods are used to insure the maximum degree of publicity. Illustrated articles are published in the company magazines. Posters showing safe methods of performing work or hazardous practices to be avoided are displayed each month by the operating companies.

First-aid activities have been standardized with respect to the subject matter to be taught, the methods of teaching, and the first-aid equipment provided. All companies use a textbook prepared by the American Telephone and Telegraph Company in cooperation with the American Red Cross. For the use of new employees who have not yet received formal instruction in first-aid practices, a small handbook is available containing terse directions for the treatment of the more common injuries. Through further collaboration with the Red Cross all instructors are thoroughly trained in standard first-aid practices. Two first-aid kits have been standardized, the larger for group use and the smaller for individual use.

Standard provisions are followed throughout the System with regard to the physical environment under which the telephone operating forces perform their duties with a view to providing the most healthful conditions. These standards relate to light, heat, ventilation, rest rooms, lunch rooms, etc.

10

Cooperation with Outside Standardizing Bodies

Reference has been made from time to time in the above discussion to cooperation with outside standardizing bodies. While a very large part of the standardizing work of the Bell System is of interest in connection with its own activities alone, some of this work is of general interest and the System is cooperating in these cases with the other organizations interested for the purpose of developing standards of more general application.

The extent of this cooperative work with other organizations is illustrated by the following items:

American Standards Association—The Bell System is cooperating with other interested organizations in the development and promulgation of American engineering and industrial standards through the American Standards Association. Representatives of the Bell System and of the United States Independent Telephone Association form the Telephone Group in connection with this work. Standardization work of a technical nature is usually carried out in the American Standards Association by sectional committees, on more than 20 of which the Bell System now has representation.

American Institute of Electrical Engineers—The Bell System cooperates actively in the work of the Standards Committee of the A.I.E.E. At the present time two Bell System men are members of the Standards Committee and others are members of working committees of the Standards Committee.

American Railway Association—The Bell System and the American Railway Association have formed a Joint General Committee to provide machinery for developing mutually acceptable standards in connection with the coordination of communication lines and the electrical supply facilities of the railroads, with particular reference to inductive coordination.

Representatives of the Bell System are also cooperating with ten committees of the Telegraph and Telephone Section of the American Railway Association engaged in standardization work relating to communication and allied problems.

Institute of Radio Engineers—Four Bell System men are members of the Standards Committee of this organization.

American Society for Testing Materials—The Bell System has representatives on many of their technical committees working on standard methods of tests and specifications, including those for non-ferrous metals, insulating materials, magnetic materials, protective coatings, etc.

National Electric Light Association—The Bell System and the National Electric Light Association have formed a Joint General Committee for the purpose of developing mutually acceptable standards for the coordination of communication lines and electrical supply facilities, with particular reference to inductive coordination, the joint use of poles, and crossings.

International Electrotechnical Commission—The Bell System has two representatives on the United States National Committee of this Commission.

The above reference to some of the principal standardizing projects in which the Bell System is cooperating with other bodies is not at all inclusive but indicates in a general way the scope of this work.

11

Conclusion

The above general outline of standardizing activities in the Bell System is sufficient to indi-

cate the outstanding part which standardization has played in the building up of the Bell System. For many years, standardization based upon not only the present needs of the telephone system but also the best picture obtainable of future trends, has been an integral part of the program of development of telephone service. One type of standardization increases both the possibility and the advantages of another type so that in such an organization, standardization activities ramify through the entire structure and touch every part of the work.

The total economies resulting from standardization and simplification, of course, it would be impossible to closely estimate. Standardization, as indicated above, has been productive of many advantages in addition to economy. The advantages from standardization may be summarized as follows:

1. Standardization makes the best available for all.

2. Standardization based on careful consideration of the requirements of the telephone subscriber results in more convenient and dependable service at lowest possible cost.

3. Standardization reduces the cost,because, when all companies use the same things, they can be manufactured in the largest quantities and uniformity in output contributes to economies in production.

4. Standardization reduces the cost of carrying stocks of materials and the cost of maintenance and repairs, because fewer parts have to be carried and maintained.

5. Standardization reduces the cost of instruction of new employees because there are fewer things with which to get acquainted.

6. Standardization reduces accounting costs because there are fewer types and sizes of materials to keep track of.

7. Standardization minimizes complicated engineering and operating problems that might result from intercommunication between widely divergent systems and apparatus.

8. Standardization renders available large supplies of materials and labor in emergencies.

9. Standardization greatly facilitates development work, since improvement in, or development of, a new article involves a coordination with a smaller number of associated parts.

(Discussion of Dr. Osborne's paper will be reported in the October issue of the BULLETIN.)

Bell System Standardization Discussed at Council Meeting

A paper on the standardization work of the Bell System, printed in this issue of the ASA BULLETIN, featured a meeting of the ASA Standards Council held at the Westinghouse Lighting Institute in New York on September 10, with Cloyd M. Chapman, chairman of the Standards Council, in the chair. The paper was presented by Dr. H. S. Osborne, Transmission Engineer of the American Telephone and Telegraph Company. Dr. Osborne's paper was discussed by Arthur Huntress, Standards Department, Ingersoll-Rand Company; Harry E. Harris, Consulting Engineer, Harris Engineering Company; W. C. Cushing, Engineer of Standards, Pennsylvania Railroad System; Dr. Zay Jeffries, Aluminum Company of America; H. P. Charlesworth, Vice-President, Bell Telephone Laboratories; J. C. Irwin, Valuation Engineer, Boston and Albany Railroad; John A. Capp, Chief of Testing Laboratory, General Electric Company; Cloyd M. Chapman, Consulting Engineer, United Engineers and Constructors; Charles R. Harte, Construction Engineer, the Connecticut Company; F. O. Hoagland, Pratt and Whitney Company; P. G. Agnew, Secretary, American Standards Association; A. L. Stadermann, Citizens Independent Telephone Company; W. F. Dixon, Works Manager, the Singer Manufacturing Company; L. T. Robinson, Engineer, General Electric Company; Frank T. Wheeler, Trumbull Electric Manufacturing Company; S. L. Nicholson, Westinghouse Electric and Manufacturing Company; W. J. Serrill, United Gas Improvement Company; Alice L. Edwards, Executive Secretary, American Home Economics Association; Worth Rogers, Operating Division, American Railway Association; Commander A. S. Dysart, Laboratory Officer, Material Laboratory, U. S. Navy Yard.

Following the discussion of Dr. Osborne's paper, Dr. Zay Jeffries, chairman of the ASA Special Committee on Introduction of Standards into Practice, presented a plan formulated by his committee to bring about the wider use of American Standards. Dr. Jeffries' report will be abstracted in the October issue.

New A.S.T.M. Price List

A price list of standards published by the American Society for Testing Materials, revised to September, 1931, has just been issued by the Society. Copies may be obtained from the ASA or the A.S.T.M. office.

ASA PROJECTS

1931 Edition of National Electrical Code Reflects Progress of Industry

by

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A review of the history of the National Electrical Code and a summary of the revisions included in the 15th edition

The 1931 edition of the National Electrical Code was certified as an "Approved American Standard" on August 18. According to custom its printing and distribution is by the National Board of Fire Underwriters. The first printing will be of 200,000 copies. Supplies to persons and to organizations will be from the offices of the National Board in New York, Chicago and San Francisco, from the National Fire Protection Association in Boston, and from ASA.

The Code is listed in the ASA Year Book as Project C-1 and accordingly is the first electrical project to have been subject to American Standards Association procedure. From many points of view this is appropriate, even if a coincidence, for the safe installation of wiring and apparatus is certainly a necessary base-line from which all other electrical standardization shall proceed.

This forthcoming edition is the fifteenth revision of the original National Electrical Code as first published in 1897. The previous (1930) edition was actually determined upon and approved in 1929. Thus a biennial frequency is continued despite the nomenclature.

The amendments to the Code are determined upon by one of the thirty-odd technical committees of the National Fire Protection Association, the sponsor body. This Electrical Committee, as it is familiarly known, is now organized as to membership and procedure so as to qualify as a Sectional Committee under the procedure of the American Standards Association. Its personnel includes 43 voting members and 41 formally listed alternates. There are thus represented 26 national, state, and local associations, inspection departments, and organizations, providing a complete cross-section of the electrical industry in so far as it is concerned with the scope of the Code.

This scope, as stated in the ASA Year Book, is as follows:

> "Requirements for the installation of electric wiring and equipment for light, heat and power, as they affect the fire hazard and for signaling systems, so far as they may involve such hazard. The Code also includes equipments affecting the life hazard in numerous applications and uses."

The Code is elsewhere described as:

> "an approved American Standard recognized by general consensus as a compilation of regulations, conformity with which is prima facie evidence that installations, within consumer premises, of electric wiring and apparatus for light, heat, and power uses provide reasonable safeguards to life and property from the fire and personal injury hazards."

The new edition employs the same format, binding, and the like as all previous ones. Likewise the editorial plan of the previous four editions is continued. To a casual reader it will appear that very few changes have been made in the text. The quantity of changes, however, is at least that of any previous revision. As to their significance or quality much will depend, no doubt, on the point-of-view. A very serious attempt has been made to secure clarity throughout and to avoid or eliminate conflicts. Certain new material appears registering the recognition of new applications of electricity. There follows a summary of the changes in each of the various articles or chapters.

Article 1. Definitions.

New definitions are given for the terms Appliance, General Use Switch, Grounding Conductor, and Isolating Switch.

Definitions Disconnecting Switch and Diversity Factor have been dropped.

[1] Chairman, Sectional Committee on National Electrical Code, C1-1931.

The definitions for Guarded, Motor-Circuit Switch, Outlet, and Service have been amended or corrected.

Article 2. General.

Sections 201 and 202, Gages and Voltages, respectively, are completely revised, but more particularly as to form rather than substance.

Minor changes in Section 203, Wire Terminals, Splices and Joints, will simplify the requirements and by the adoption of a new paragraph (a) a long standing instance of confusion as to intent is removed.

A change in the text for paragraph (b) of Section 206, General Plan of Investigation, removes another inconsistency. Other changes in the section, in paragraphs (e) and (f), add to clarity.

A new Section 207, Mounting Requirements, merely states what has been considered good practice.

Article 3. Outside Supply Conductors or Lines.

Five of the six amendments in this Article are editorial. The text of paragraph (b) of Section 307 is so changed that the now relatively frequent outdoor use of approved Christmas tree and other decorative lighting outfits has recognition and that such outfits will have suitable supports.

Article 4. Services and Service Equipment (not over 600 volts).

Paragraph (c) of Section 401 of this chapter is amended by added text to allow for special permission to have more than one set of service conductors run to a single building having a multiple occupancy.

In Section 403 additions will be made granting recognition of approved new types of multiple-conductor service entrance cables.

Section 404, covering details of service conductors, has had editorial rearrangement, necessitated (at least in part) by the recognition accorded bare grounded neutral service conductors.

Section 405 likewise is thoroughly revised editorially. Two new items appear in its text. The first of these permits the utility meter, under certain conditions, to be placed ahead of the service switch and the service fuse. The second change applies when the first one is in effect and permits the substitution, under various safeguarding limitations, of branch circuit circuit-breakers for the main service switch.

Article 5. Wiring Methods.

The report of this subcommittee records a very substantial contribution from its members, in particular Mr. L. P. Dendel, chairman. In addition to consideration of various routine items, there were before the Article Committee three fact-finding reports from Underwriters' Laboratories covering new ideas in wiring methods.

The editorial plan of the Code provides that in this single chapter there shall be recorded the various recognized general methods of installing the conductors of the wiring systems of consumer premises. Consequently there are referred to this Article Committee whatever is newly devised as a wiring method and promoted as broadly available for general use.

The changes in Section 500 are in editorial arrangement rather than of substance.

Few and minor changes were adopted for Sections 501 and 502. Since these sections cover the oldest wiring methods it is no reflection that the existing text is found to register ample safeguards.

Section 503, applying to Conduit Work, was found to require a few changes in minor technical phases of this method.

The changes in Section 504, Surface Metal Raceways (Metal Mouldings) will secure correlation between its provisions and corresponding items in other sections.

Section 505, covering Armored Cable, has been rearranged. A few of its technical provisions are modified and one or two new restrictions are adopted. One item puts the Electrical Committee on record as of the opinion that protection to insulation at cut ends of the armor is essential. It has taken thirty years for this opinion to be thus formally recorded.

The only change in Section 506, Underfloor Raceways, records an interim revision accomplished early last year following the Association's authorization of a procedure for such revisions.

Section 507, Non-Metallic Sheathed Cable, is amended only to secure correlation of its provisions, making them consistent with changes adopted for other wiring methods.

Section 508, Electrical Metallic Tubing, was materially amended accomplishing a broader recognition of this new raceway. The subject had detailed consideration by the whole membership of the Electrical Committee at its annual meeting in February, and, as is natural with a relatively new project, views somewhat diverging were voiced in the discussion. The text adopted is substantially that proposed and recorded in the printed report of the Article Committees which was circulated in January. In effect, this product is now to have practically general recognition as a wiring raceway in sizes up to 2-inch for circuits carrying up to 50 amperes and operating at not over 300 volts. The Article Committee report pro-

duced a formal resolution from the Rigid Conduit Industry, protesting the extended recognition. This was fully considered by the attendance at the Electrical Committee meeting.

Section 509, Cast-in-Place Raceway, required no changes.

The changes in Section 510, Underplaster Extensions, secure correlation with provisions of related sections of the chapter.

Present Section 511, Decorative Lighting Systems, has been deleted. Its provisions are no longer applicable.

Section 512, Auto-Transformers, is also dropped. Its provisions appear in Section 500.

A proposal to recognize an exposed branch circuit extension wiring method, which was the subject of a fact-finding report, was referred back to the Article Committee without prejudice.

The 1931 edition will include two new sections in Article 5, covering Wireways and Busways, and Auxiliary Gutters, respectively. Together with present Section 515, Bare Busbars and Risers, they effectually record changes in wiring methods made necessary by industrial development and the practically universal use of electricity for power purposes.

Sections 513 and 514 remain without changes in their respective provisions.

Article 6. Conductors.

Changes in nomenclature and classification details are made in Sections 602, 603, 608, 609, and 610. Allowable current in Nos. 18, 12, and 10 wires having other than rubber or varnished cloth insulation is increased and a conductor size of 750,000 cm is recognized in the table of Section 612. A certain amount of editing has been done in various parts of Section 613.

Article 7. Boxes, Cabinets, and Outlet and Terminal Fittings.

Minor changes in various paragraphs of the three sections of this article are of an editorial character, principally for clarity or for correlation.

Article 8. Automatic Overload Protection of Circuits and Appliances.

The subcommittee on Article 8 proposed radical structural revision of this chapter. Many of its recommendations received approval.

From a technical point of view, the changes in Sections 801, 802, 803, and 804 are immaterial and accomplish only restricting recognition of link fuses to currents above those for which enclosed types of fuses are approved.

One change in Section 805 drops a distinction formerly made between the instantaneous and the time-limit types of circuit-breakers, putting both types on a 125 per cent basis instead of the 160 per cent and 110 per cent settings previously authorized.

The next text of Section 807 will record a further step in the direction of controlling branch-circuit layout by a square footage limitation. The new limits are 1000 and 500 square feet, respectively, for residential and commercial occupancies.

Section 808, covering Motors and Motor Circuits, has been materially revised. New subdivisions will apply to feeders of motor branch-circuits and to secondary circuit conductors for wound-rotor a-c motors. Recognition of demand or diversity when more than one motor is supplied is amplified by specific suggestions. The detailed provisions for conductor sizes and automatic overcurrent protection of conductors and motors have been modified in many respects. In general, the changes are in the direction of permitting smaller conductor sizes for various sizes of motors.

A proposal to set up or recognize a new type of plug fuse for branch-circuit protection was referred back to the subcommittee pending further investigation of the patent situation.

Article 9. Grounding.

The first subdivision, Section 901, of this chapter has only one change, which appears in paragraph (e) and is somewhat more specific as to buried or driven grounds.

Section 902 is unchanged except for a new cross-reference to Article 40.

Two minor changes in Section 903 are purely editorial.

Section 904 is changed only as necessary for correlation with changes in Section 907.

The cross-references in Section 905 are added to as well as corrected.

The changes in Section 906, Grounding Portable Equipment, accomplish protection in the case of all portable apparatus operating at more than 600 volts, of portable heaters on circuits of more than 150 volts to ground or in permanently moist locations whatever the voltage.

The principal changes in the Article appear in Section 907, Grounding Conductors. An attempt was made to clarify its provisions by rearrangement of the text which was "invited" because of approval of the use of uninsulated grounding conductors for interior wiring systems.

Article 10. Rotating Machinery and Its Control Apparatus.

Various paragraphs in each of the five sections of this Article are modified. In some cases this was done to secure consistency with changes in other articles, for example, in Article 1—Definitions. A few obsolete or otherwise unnecessary paragraphs were deleted. The tech-

nical changes in each case seem of minor significance but reflect practices now regarded as desirable.

Article 11. Transformers and Capacitors.

The changes adopted for paragraph (a) of Section 1102, while more specific as to enclosures when provided, permit their omission when the devices are of reasonably small capacity and accordingly the quantity of oil present is not excessive. The new text of paragraph (c) of this section will clearly exempt certain forms of transformers from the installation provisions of the preceding text. A new paragraph (f) calls for certain new name-plate data on various types of transformers and capacitors.

Article 12. Switches.

The six changes made in the provisions of this Article are of minor significance but will assist in consistency and clarity.

Article 13. Switchboards and Panelboards.

The only changes in this Article correct cross-references to other articles when paragraph numbering has been altered.

Article 14. Fixtures, Lamp-Holding Devices, Plug Receptacles, and Other Outlet Devices.

But one of the changes made in this article requires comment. This change, in paragraph (d) of Section 1402, eliminates the requirement for rubber insulation for fixture wires when the fixture is to be installed in a dry place. The insulation hereafter required is to be heat-resisting. The change reflects modern designs in fixtures and the operating temperatures of the present incandescent lamp.

Article 15. Lamps.

No changes appear in the provisions of this Article.

Article 16. Electrical Appliances.

The single change appearing in the text of Article 16 relates to a new provision in Article 9, Grounding. In other words, it is a form of cross-reference.

Article 17. Resistors, Reactors, and Capacitors.

The second and third sentences of paragraph (h) of Section 1701 have been deleted. They refer to practices now obsolete. Section 1703 is combined with Section 1702 and the text of former paragraph (b) of Section 1703 is modified, accomplishing recognition of wire-wound resistors on screw-shell bases on the same basis as lamps put to a like use.

Article 18. Storage Batteries.

A complete new text is provided for this Article. Originally the provisions of the Article were applicable to open-top type wood box batteries used as stand-by or to supplement privately generated power supply. Recent applications of storage batteries, either lead-acid or alkali, for emergency lighting have created a demand for appropriate code treatment. At the same time the need for regulations on the original type has disappeared.

The new text had circulation a year ago and when presented for final adoption required only minor editorial changes to secure unanimously favorable action.

Article 19. Lightning Arresters.

Section 1901 of this Article is completely revised and made applicable to Industrial Stations, which, however, are not defined. Probably this is wise, at least for the present, while a consensus as to details is developing. The rapid increase of instances where a consumer's equipment is on the scale of a utility sub-station will no doubt produce field experience enabling agreement, not only on operating but on safeguarding essentials.

The Committee on Article 19 took note of and commented upon the question of lightning arrester equipment for rural buildings supplied from outside open wires, but is not prepared to offer specific recommendations at this time.

Article 30. Cranes and Hoists.

The changes agreed upon in existing paragraphs and the provisions of the new paragraphs adopted for Sections 3003, 3004, and 3006 not only record development in these industrial tools but likewise record the results of a new feature in the work of this Electrical Committee.

A year ago authorization was given for special voting members in Article Committees, such members to be representatives of organizations concerned particularly with the scope of an Article rather than with the broad scope of the National Electrical Code. Under this plan Messrs. Schramm and Price, Electric Overhead Crane Institute, worked in the Committee on Article 30, and there is this assurance that the changes now made and endorsed are practical in their application and consistent with modern good practice.

Article 31. Elevators.

The changes in Sections 3102, 3103, 3104, and 3105 of this Article have principally to do with limits of conductor sizes, the use of a flame and moisture-proof outer finish on conductors and recognizing in the machine rooms the new wiring methods, wireways, and auxiliary gutters provided for general use in Article 5.

Article 32. Hazardous Locations.

In addition to a number of minor changes

in the text of the present sections of this Article, most of which are editorial in intent, a complete parallel text is provided in new Section 3206 for a so-called Class IV, Hazardous Location. This is defined in new paragraph (d) of Section 3201.

> Class IV locations are those in which easily ignitable, combustible fibers are stored or handled (except in rooms where in process of manufacture) and which are hazardous through such fibers being ignited by arcing contacts, resistors, lamps, or similar apparatus.
>
> This class may include locations such as warehouses in which are stored or handled combustible fibers such as cotton (including cotton linters and cotton waste), sisal or henequen, ixtle, jute, hemp, tow, cocoa fiber, oakum, baled waste, kapok, Spanish moss, excelsior, and other similar readily ignitable fibers.

This addition was proposed and adopted after contact with and concurrence by the N.F.P.A. Committee on the Storage of Combustible Fibers.

Article 33. Garages.

Five of the changes adopted in this Article have the effect of clarifying the previous text and to register more specifically the hazardous character of the zone at the floor-level. The remaining change provides better identification of a safeguard already specified.

Article 34. Motion-Picture Studios.

A new Section covering wiring in connection with Sound Recording and Reproduction, first proposed and published a year ago and now formally accepted, appears in this next edition of the Code.

Article 35. Motion-Picture Projection Equipment.

The new text applicable to the ventilation of projection rooms or booths no longer conflicts with other standards of the sponsor organization.

In addition the interim revision affecting paragraph (c) of Section 3504 was again confirmed.

Article 36. Organs.

No action was proposed and none was taken relative to the text of this Article. However, it was voted to change the location of these provisions in the arrangement of the Code. In the 1931 edition the text will be interchanged with that of Article 39, thereby securing a measure of sequence in the chapters applicable to Motion-Picture Studios (34), Projection Machines (35), and Theatres (new number 36).

Article 37. Radio Equipment.

No changes were made in this Article. A year hence provisions covering centralized systems are promised.

Article 38. Signs and Outline Wiring.

The changes in this Article are of minor technical significance.

Article 39. Theatres; Including Motion-Picture Houses.

The changes in this Article, hereafter to be Article 36, accomplish recognition of the use of electrical metallic tubing and of surface metal raceways as wiring methods in the auditorium and dressing rooms, and on the stage.

A new section provides for portable switchboards on the stage.

Other changes are of editorial character.

Article 40. Isolated Plants, 0–50 Volts.

The single change provides for the grounding of one conductor of circuits which are run overhead between buildings.

Article 50. Circuits and Equipment Operating at More than 600 Volts between Conductors.

Changes in Sections 5002 (Vacuum and Inert-Gas Tube Systems) and 5012 (X-Ray and High-Frequency Apparatus) record field experience, development in the arts, and results of application of the former rules.

The changes in Sections 5003 provide clarity.

In Section 5006 recognition is given to new types of fuses for use in circuits to industrial apparatus.

Article 60. Signal System.

The single change in this text was to correct punctuation of paragraph (d) of Section 6003.

A.I.E.E. Submits Six Standards for Consideration by the ASA

The following standards have been submitted to the ASA by the American Institute of Electrical Engineers for consideration by the Electrical Standards Committee:[1]

C53, Recommendations for the Operation of Transformers (A.I.E.E. No. 100 with revisions)

C54, Constant Current Transformers of the Moving Coil Type (A.I.E.E. No. 12)

C55, Capacitors (A.I.E.E. report No. 18 with revisions)

[1] See page 9 of the August 1931 ASA BULLETIN for a description of the formation of the Electrical Standards Committee.

C56, Sixty-Cycle Test Voltage for Standard Bushings for Transformers (a new proposal by the A.I.E.E.)

C57, Transformers, Induction Regulators, and Reactors (A.I.E.E. report No. 13 with revisions)

C48, Electric Railway Control Apparatus (revision)

The last mentioned standard consists of a revision of A.I.E.E. Standard No. 16 and is, further, a revision of that part of C36-1928 Railway Control and Mine Locomotive Control Apparatus which deals with electrical railway control apparatus.

These standards will be referred to the Electrical Standards Committee at its organization meeting which will probably be held during September.

A.H.E.A. Urges Use of Standards by Retailers

The following resolution was adopted by the American Home Economics Association at its annual meeting which was held in Detroit on June 25:

WHEREAS, the Association has for some time been cooperating with manufacturers and distributors through the Departments of Commerce and Agriculture and the American Standards Association in the development of standard specifications as to the composition, construction, and performance of household goods;

AND WHEREAS, it is frequently true that standards now available are not used by retailers in selling over the counter because they do not realize the value of accurate information to the household buyer;

AND WHEREAS, the Association can perform a valuable service by establishing contacts between progressive retailers and homemakers desirous of increasing the efficiency of their buying;

Be it resolved that the members of the Association cooperate in every way with the retailers in their own communities to further the purchase and sale of consumers' goods labelled according to standards set up through the American Standards Association, the Bureau of Standards of the United States Department of Commerce, or the Bureau of Agricultural Economics of the United States Department of Agriculture, or labelled in some other way with accurate measurements as to quality and performance.

Progress Being Made in Work of Sectional Committee on Rotating Electrical Machinery

The sectional committee on Rotating Electrical Machinery—C50, under the sponsorship of the American Institute of Electrical Engineers and the National Electrical Manufacturers Association, which is engaged in the work of revision of the A.I.E.E. standards covering alternating current machinery, direct current machinery, induction machinery, alternating and direct current fractional horse-power motors, and synchronous converters, which were submitted to the ASA for approval, has issued preliminary drafts for consideration by the sectional committee and for discussion at a meeting of the committee to be held in the early fall. Copies of the reports on the standards for the various classes of apparatus are available for loan through the ASA.

A.R.E.A. Withdraws Proposals for Railway Bridge Standards

The American Railway Engineering Association has recently advised the ASA that certain standardization projects are to be withdrawn from further consideration by the ASA. The projects referred to are:

A3a-General Specifications for Steel Railway Bridges

A25-Specifications for Movable Railway Bridges

These specifications, intended to cover certain details for steel railway bridges, were first submitted to ASA in 1923 with an accompanying request for approval by ASA as existing standards. After further consideration by all interested parties, the American Railway Engineering Association has now decided to withdraw its submittal of these projects.

Packaging of Overhead Electric Railway Equipment

The Division of Simplified Practice of the National Bureau of Standards has recently announced that signed acceptances have been received from a sufficient number of producers, distributors, users, and others interested in the simplification of packaging of overhead electric railway equipment, to insure the general adoption of the program by the industry as a whole. It is expected that printed copies of these recommendations will be available shortly.

The Development of a Standard Safety Code for the Construction Industry

by

W. R. Smith,[1] *Chairman*
Construction Safety Code Committee

Sectional committee seeks to develop code which will serve as a guide for an industry with difficult accident prevention problems

Our Committee, appointed as a result of executive action on the part of the National Safety Council and the American Institute of Architects, has for its purpose the development of a safety code for the construction industry, the scope of which, as recorded in the minutes of the meeting held on October 2, 1930, at the William Penn Hotel in Pittsburgh, shall be as follows:

> "Construction, demolition, and repair of buildings, including excavation, foundation work, steel erection, scaffolding, lighting, openings, temporary floors and stairs, in relation to accident hazards to employees and to the public."

The Council and the Institute are fully aware of the fact that the construction industry is pointed out today as one of the most serious offenders in the matter of safety to workers, and recognize the obligation which obviously rests on them, as well as on those other national and professional organizations in any way concerned with this matter, to improve this situation. Those construction companies whose policies are dictated by sound principles from both the humanitarian and economic points of view, many of which are experiencing low frequency rates as a result of constant striving and constructive effort to make the working conditions on the construction projects as safe as possible, must realize and take heed of the fact that no such condition obtains generally throughout the construction industry. Therefore, it is equally obvious that the obligation in this matter rests on the various individuals, who, as officials or in other executive positions with the progressive construction companies, direct and dictate the policies of such companies.

A document which may be considered a guide toward correct procedure and which will incorporate the best out of the experience of all of those in any way associated with this matter is, therefore, believed to be desirable and urgently needed.

[1] Assistant Chief Engineer, United Engineers and Constructors Inc., Newark, N. J.

The Purpose of the Code

The purpose of the code is primarily educational. Such a document as is proposed should, when completed, summarize the best practices now in vogue throughout the construction industry. The adoption of the Code by individual companies will be entirely voluntary but it is anticipated that if the Code has been carefully and effectively prepared, it will be immediately endorsed and observed by all of the leading companies whose practices in this regard will in many instances exceed the specific requirements of the Code, and to those companies who have not to date followed practices which are in the interest of safety on construction the Code will constitute a dependable guide which has been developed by the industry itself. The prestige and influence of such a document, as time goes on, will increase as it is observed and supported by the construction companies, and thus in the most constructive and permanent way will other construction companies be induced to heed and observe its requirements.

The Problems before the Industry

One of the difficulties at present is the lack of the proper instrument for bringing to the attention of the small contractors usable and practicable information concerning the approved safe methods and policies as practiced by the larger and more progressive companies. The Code will make the accomplishment of this possible. The second and equally important problem is that of bringing about a reduction in compensation insurance rates.

Probable Influence of the Code on Compensation Insurance Rates

Compensation insurance rates are based on the accident experience of the industry. It is a

well-known fact that at the present time construction industry accident rates (both frequency and severity) are just about twice as high as the average rates of all industries. This statement is predicated on the statistics compiled and tabulated last year by the National Safety Council. Is it not to be expected, therefore, that the insurance rates will be high? The Code cannot of itself have any immediate effect on insurance rates, but all work of this character looks to the future, and in this instance should unquestionably prove to be a step toward the ultimate reduction of insurance rates because of the improvement that should come in accident rates as a result of the influence of the Code. The Code cannot, of course, be looked upon as a "cure-all" for the condition now existing in the construction industry. It will need to be used in such a way that it will go hand in hand with other educational work of a consistent and permanent character, but without doubt a simple, workable Code will be of considerable value in influencing those contractors formerly appearing to be uninterested in safety work of a constructive nature. This statement applies particularly to the smaller contractors who have evidenced unwillingness to adopt the safe methods and practices now employed by the larger and more progressive companies.

The Code will be developed from the best data and information available, and much of this has already been formulated into codes or manuals. Where the scope of the construction safety code touches fields already covered by an existing code dealing specifically with phases of the subject, such codes will be referred to for detail requirements and provisions.

The Character of the Code

It is intended that the Code be a simple workable document. It will specifically call for the doing of those things which are already being done and which we (the Committee) will consider essential. It will not be idealistic. It will specify minimum requirements and not maximum.

There will be many details that the committee will want to be specific about, and which requirements should be observed. Such requirements will not prove to be a hardship on the progressive companies but will definitely set forth the procedure to be observed for those companies that at the present time are unmindful of the risks that are being run or the hazards that exist on their work.

The Scope of the Code

The question will naturally arise as to whether or not the Code will attempt to cover construction of both building and engineering character and for projects of all sizes. The Code is intended to pertain to building construction and it is anticipated that the combined talent and experience of those who will handle this matter, representing all of those interests identified with the industry, will produce an adequate Code generally applicable to all of the various construction phases of building projects with which the industry is concerned.

Personnel of the Committee

In accordance with the procedure of the American Standards Association the Committee includes representatives from the six different interests concerned; namely,

1. Manufacturers of materials and equipment
2. Employers
3. Employees
4. Insurance interests
5. Governmental officials
6. Technical experts

In accordance with the above, the following organizations are represented on the Committee. The names of their official representatives are in parentheses after the names of the organizations:

American Institute of Architects (Samuel R. Bishop)
American Society of Civil Engineers (Leonard C. Wason)
American Society of Mechanical Engineers (Col. William A. Starrett)
Associated General Contractors of America (John W. Cowper)
Association of Governmental Officials in Industry (W. C. Muehlstein)
Building Officials' Conference (John W. Oehmann)
International Acetylene Association (representative to be appointed)
International Association of Industrial Accident Boards and Commissions (Charles R. Blount)
National Association of Builders' Exchanges (William Tubesing)
National Association of Building Trades Employers (Gerhardt F. Meyne)
National Association of Mutual Casualty Companies (William A. Dearborn)
National Bureau of Casualty and Surety Underwriters (Thomas J. Whelan)
National Safety Council (William R. Smith; W. Dean Keefer)
National Safety Council—Accident Prevention Equipment Manufacturers Section (Fred Davidson)
United States Bureau of Standards (Nolan D. Mitchell)

United States Department of Labor (John J. Hynes, William F. Kelly, *a third representative is to be appointed*)
Rudolph P. Miller—Member-at-Large

The advantages to the work of having representation from all of these interests will be apparent. Conflicting or competing codes are undesirable and to be avoided in all matters of this kind. Saying the same thing in many different ways is confusing, and it is, therefore, desirable that all concerned work together to produce a code for the industry.

The Code that will thus be developed under the guidance of the representatives of these interests will constitute a real consensus of the very best opinions and judgments in this matter. As such it will be a document based on experience, sound judgment, and technical knowledge, developed in an atmosphere of cooperation and of mutual understanding. When completed it cannot fail to command the respect of the industry and warrant the whole-hearted endorsement by all concerned of its purpose, and uniform observance of its requirements.

Progress of the Work

The following Committee organization has now been completed and the development of the various sections of the Code is proceeding under the direction of the subcommittee chairmen:

Subcommittee 1. L. C. Wasson, Aberthaw Company, 80 Federal Street, Boston, Massachusetts, Chairman. *Scope*—Demolition.

Subcommittee 2. Rudolph P. Miller, Consulting Engineer, 101 Park Avenue, New York, N. Y., Chairman. *Scope*—Excavation, foundation work, blasting, and compressed air work.

Subcommittee 3. J. W. Oehmann, Building Officials Conference of America, Room 112 A, District Building, Washington, D. C., Chairman. *Scope*—Scaffolding, ladders, temporary guard rails and toe boards, floor openings, sidewalk sheds, temporary stairs, runways and ramps, lifelines, and safety belts.

Subcommittee 4. W. A. Starrett, Starrett Brothers & Eken, Inc., 101 Park Avenue, New York, N. Y., Chairman. *Scope*—Passenger elevators, material hoists, hoisting machinery, derricks, signals, cables, ropes, chains, blocks, barricades, and towers.

Subcommittee 5. N. D. Mitchell, U. S. Bureau of Standards, Washington, D. C., Chairman. *Scope*—Steel erection, temporary floors, welding, and cutting.

Subcommittee 6. W. A. Dearborn, Federal Mutual Liability Insurance Co., Boston, Mass., Chairman. *Scope*—Housekeeping, temporary lighting and wiring, salamanders, packing and storing materials, waste disposal, temporary sanitation, and first aid.

The above subcommittee chairmen, together with the chairman, vice-chairman, and secretary of the sectional committee, make up the Executive Committee of the sectional committee.

S. R. Bishop, associated with D. Everett Waid, 1 Madison Avenue, New York City, is vice-chairman of the Committee; and W. Dean Keefer, Director of the Industrial Safety Division, National Safety Council, Chicago, Illinois, is secretary.

It is contemplated that during the development of the Code, contact will be established by the subcommittees with all organizations in any way concerned with this matter, such as those enumerated below, and whose representatives may be invited to participate in the activities of the subcommittees in connection with the accumulation of material for the various sections: American Concrete Institute, American Institute of Consulting Engineers, American Institute of Steel Construction, American Railway, Bridge and Building Association, American Society of Sanitary Engineering, American Welding Society, Association of Electragists International, Composition Roofers and Waterproofers, Concrete Reinforcing Steel Institute, Contracting Plasterers Association, Contracting Plasterers International Association, Electric Hoists Manufacturers Association, Heating and Piping Contractors National Association, Hollow Metal Door and Trim Manufacturers Association, Marble Industry Employers Association, Mason Builders Association, Master Carpenters Association, Master League of Cement Workers, National Association of Master Plumbers of United States, National Association of Sheet Metal Contractors, National Lumber Manufacturers Association, Plumbing and Heating Industries Bureau, Roofing and Sheet Metal Contractors Association, Tile and Mantle Contractors Association of America, Window and Plate Glass Dealers Association.

Forthcoming Meeting of the Committee

It is anticipated that the committee will be able to hold a meeting during the forthcoming Annual Congress of the National Safety Council, which will convene in Chicago, and the date of Thursday, October 15, has been tentatively set. Definite announcement regarding the date and hour will be sent to all members of the committee in ample time to permit of their making arrangements to attend.

Simplification and Standardization of Manhole Frames and Covers

by

L. B. Fish,[1] *Chairman*
Sectional Committee on Manhole Frames and Covers

Discs of cast-iron dotting the pavement here and there are such commonplace things that most people do not give much thought to them or realize the very great number of differences in shape, size, and design that exist at present. The most surprising thing about these cast-iron discs, which with their supporting castings are generally referred to as manhole frames and covers, is that, in order to accomplish the simple purpose of providing a hole which can be closed when not in use, of such size that a man can enter and leave through it and large enough to permit certain material and equipment to be passed through, there are literally thousands of different types and sizes of frames and covers in service today. In one city alone having a population of about 500,000 it is estimated that there are at least 100 different types and sizes in use. A single foundry in another city reports that it has about 2000 different sets of patterns for manhole frames and covers and nearly 600 of these sets of patterns are listed as being active at the present time.

This great diversity in types and sizes of castings used for the same general purpose is due to a number of causes but principally to lack of standardization. It has been said that manhole frames and covers are the least standardized articles in commerce. Even in the matter of such a simple detail as the size of the opening there has been no attempt heretofore to adopt a range of sizes that could be used satisfactorily throughout the country as a whole for various purposes. When one studies such details as the dimensions of the various parts of these innumerable types and sizes of castings, it would seem that the one idea most generally adhered to in the past was that each purchaser of manhole frames and covers should have a type and size different from any others that had previously been made.

The great majority of these differences in type and size cannot be justified on any logical basis. Of the manhole covers in use today some are square while others are rectangular; many of them are round and some have been noted that are elliptical in shape. A still further variation in the general shape can be found in the rectangular or square covers which are made with the corners rounded to an appreciable radius. In each one of the general shapes just mentioned a great many different types and sizes have been produced owing to different ideas in regard to details of design such as ribbing, holes for lifting hooks, dimensions, and pattern of the top of the cover. All this has resulted in numerous designs which are not only ill suited in many cases to the purpose intended but to foundry practices as well.

Obviously this is a field in which there is considerable to be gained through simplification and standardization. For example, breakage due to insufficient metal, poor quality of metal, and non-uniform distribution of the same could be eliminated; special core work and other increased costs of molding to care for unnecessary features, that have been introduced into what was previously a good practical design, would not be necessary; duplication of patterns and increased pattern costs where slight and unnecessary changes in design necessitate a new pattern would be things of the past; and waste of metal where castings are made too heavy would not occur.

In addition to all the advantages obtained through elimination of these undesirable features, the standardization of the relatively few necessary types and sizes would permit greater quantities of castings to be contracted for at one time and the consequent lowering of costs. Where there is a continued demand for the same types and sizes of castings, manufacturers do not hesitate to carry a reasonable stock, and the manufacture of these stocks can be carried on during dull periods, thereby helping to keep men employed and at the same time reducing overhead expense.

Inspection of manhole frames and covers is essential in order to insure that they meet the requirements of the specifications. With relatively few standard sizes this inspection work can be simplified and carried on at a minimum

[1] American Telephone and Telegraph Company, New York, N. Y.

cost because the types would be practically the same at all foundries and the inspectors would be more familiar with the requirements and various features to be observed than if they were concerned with the inspection of many types and sizes.

Considerable work has been done by the sectional committee which was organized a few years ago under the procedure of the American Standards Association to take up the work of standardization in this field.

This sectional committee—whose work is jointly sponsored by the ASA Telephone Group and the American Society of Civil Engineers—is divided into six subcommittees, each one dealing with this problem from a particular standpoint. The division is mainly along the lines of the various fields of use for manhole frames and covers which are as follows: sewer, water, gas, steam, and air; electric light and power; electric railways and steam railways; communication systems. In addition there is a subcommittee on specifications and inspection, and a correlating committee, the latter having been formed to consider the various types and sizes recommended by the other subcommittees with a view to reaching an agreement in regard to the essential features and to coordinate and simplify the various details in order that the number of types and sizes might be reduced to a minimum. Tentative specifications and drawings have been prepared covering the types and sizes for which there seems to be a general need at the present time, and it is the intention to have these tentative specifications and drawings widely disseminated in the near future for the purpose of obtaining comments and suggestions from municipalities, utilities, manufacturers, and others who are interested in this project.

Owing to the large use that is made of manhole frames and covers by municipalities all over the country, when the work was started, the committee gave consideration to the possibility of simplifying and coordinating the types and sizes already in use in the municipal field with the thought that it might be possible to build up standard designs around certain types and sizes now in use. Owing, however, to the great variations encountered not only in design but in size, it was found impracticable to do this. Consequently, the following method of attacking the problem was adopted.

Types and Sizes Reduced

The proposed designs were arrived at by each subcommittee of the sectional committee recommending the types and sizes that seemed to be necessary in the particular class of work which it covered. These recommendations were later studied by the correlating committee and the number of types and sizes reduced to a minimum. The work has been carried on along the lines of retaining in so far as practicable those features of design which have proved of value over long periods of service and the dimensions have been chosen with due consideration to those which are used in practice and have been found to be suitable. Furthermore, in reducing the number of designs and sizes the committee has probably erred on the side of not unnecessarily restricting the users of these articles, which seems most desirable in initiating a project of this magnitude.

Simplification of Materials

The matter of simplification has been extended to the materials involved as well as to the designs and sizes, in order that the standards recommended may be obtained anywhere in the country and at a minimum cost.

Most of the manhole frames and covers that are in use at present are gray iron castings and, where designs are suitable and a good grade of cast iron has been furnished, the experience with such castings over long periods of years has been that they are satisfactory and economical. For these reasons the proposed specifications require gray iron castings for all sizes of manhole frames and all covers up to and including those for frames having openings of 30 inches in diameter in the clear. In the case of covers for the frames having openings in the clear of 33 inches, 36 inches, and 42 inches in diameter, which are required on account of the sizes of large transformers that will be installed in the manholes, cast steel covers are required in the proposed specifications in order to reduce the weight to a point where these large covers can be removed and replaced by the ordinary means employed for the smaller cast-iron covers.

In the matter of shape, the committee recommends that the openings in all manhole frames be round, which means the use of round covers. With the round frame and cover, less metal is required per unit area of opening than for any other shape, and the machining of the cover seat and cover is simplified. Furthermore, round covers can be handled with greater facility than square or rectangular ones and it is not possible to drop them into the manhole with the possibility of causing considerable damage. Flat covers are recommended in all cases because they contribute to smooth riding pavements and facilitate the operation of snowplows and scrapers in cleaning the pavement and shoulders of the roadway.

The diameters of openings recommended at present in the clear of the frames are as follows: 22 inches, 24 inches, 27 inches, 30 inches, 33 inches, 36 inches, and 42 inches.

The 22-inch size is a straight type of frame with a round base. In the 24-inch size which is a flared type of frame, there are two types, one with a round base or flange and the other with a square flange. The 27-inch and 30-inch sizes of frames involve twelve different types which are recommended to meet various conditions, such as round and square flanges at the base, shallow types to care for changes in street grade, light-weight types for use where there is no vehicular traffic, and the type with locking inner cover used where it is desirable to control access to cables and also to protect open cable splices from surface water. The 33-inch, 36-inch, and 42-inch sizes are of the straight type with square flanges.

The height of the frame or the vertical distance from the top of the casting to the bottom of the flange varies from $1\frac{1}{2}$ inches on the shallow ring for sidewalk use to 11 inches for the straight type of frame with inner cover, the provision of the latter causing this greater height. The intermediate heights are $5\frac{5}{8}$ inches, 7 inches, 8 inches, and 10 inches, respectively, as required by the particular design of the casting.

Machining is specified for both the horizontal and vertical faces of the cover seat or rabbet in the frame and the surfaces of the cover that come in contact with these faces. This has been done in order to obtain an even bearing of the cover in its seat, which will prevent rocking, and thereby eliminate noise and much of the wear. By machining the vertical surfaces it is possible to obtain a close fit of the cover, thereby reducing considerably the sidewise movement of the cover and the wear that such movement entails.

The proposed specifications and drawings cover thirteen types of frames and six types of covers caring for seven different sizes of manhole openings. Space does not permit of description of all the details of these types and sizes, but when the specifications and drawings are sent out for general comment, and those who are concerned with the manufacture and use of manhole frames and covers have this information before them, they can assist the committee to a great extent by submitting their constructive comments, as it is only through the interchange of ideas and suggestions on the various features that the work which has already been done can be extended to take care of all types of manhole and road construction that are involved in the use of such castings.

Papers on Sampling Available

Reprints of two papers by Dr. W. A. Shewhart of the Bell Telephone Laboratories, bearing on questions discussed in previous issues of the ASA BULLETIN, particularly with respect to the method and amount of sampling required to provide a proper basis of inspection under specifications, have been received by the ASA Information Service, and are available to those interested in this subject. The papers are *Random Sampling*, a statement of the conditions under which a sample has practical significance, and *Statistical Method in Engineering*, a discussion of the statistical character of physical properties and laws making necessary the application of statistical theory in engineering. These papers, which appeared as monographs in the Bell Telephone System series of technical publications, were presented before the Mathematical Association of America and the American Statistical Association, respectively. As with previous papers in this field, these have an important bearing on the proper application of the inspection technique in the determination of whether or not goods or commodities which have been sampled are to be accepted or rejected under the specifications or standards applied.

Swedish Standardizing Body Enlarges Scope

As the result of recent legislation, the Swedish Government has approved an enlargement of the scope of the Swedish Industrial Standardization Committee (Svenska Industriens Standardiseringskommission) to include other than engineering standardization and has changed the name of the committee to the Standards Commission of Sweden (Sveriges Standardiseringskommission).

Amos Kruse, formerly general secretary of the Commission, has been continued as manager of the Commission with the title of Managing Member of the Council.

Electrolimit Gage Checks Work on Quantity Production Basis

Magnification of errors from 500 to 10,000 times is possible with an electric gage now sold by the Pratt & Whitney Company, Hartford, Connecticut. The electrical parts of this device are made by the General Electric Company and the other parts by the Pratt & Whitney Company. This Electrolimit gage is a sensitive comparator, suitable for checking work on a quantity production basis to close limits. Previously its use was confined almost exclusively to the laboratory—*From the August, 1931, issue of Machinery.*

STANDARDIZATION WITHIN THE COMPANY

The Economic Significance of Specifications for Materials to a User of Steel[1]

by

P. Parke, *Chief Engineer*
The Pullman Company

Pullman Company finds carefully drawn material specifications valuable to both manufacturer and user, and an aid to progress in the industry

The organization with which I am connected has a plant capacity to consume over 150 carloads of ferrous metals per day, or 2,250,000 tons per year. Appreciating as I do the compliment of the invitation to speak on the subject assigned, I assume that I owe the invitation to the fact that I represent such a potential consuming capacity and that my observations may be expected to reflect experience in dealing with materials on rather a large scale. At the outset I have to make acknowledgment of valuable aids which the American Society for Testing Materials has rendered to industry through the development of standard material specifications. Of these I shall attempt briefly to point out the why and wherefore, with special reference to the uses of steel; to suggest the useful purposes which standard specifications serve and the manner in which they are of economic value to the user. It has seemed to me that, just as insistence on accurate definitions gave birth to philosophy, and philosophy in turn flowered into pure science—so the trend today is toward the crystallization of more knowledge and the elimination of mystery concerning the things with which we deal in every-day life. What is the demand for a specification, but a repetition of the age-old desire for a definition of the needs of man? In its economic significance, the specification is an aid to the progress and well-being of mankind.

In general, material specifications are of particular economic importance to the large user of steel in that:

1. They are evidences of the fact that thought and study have been given to the service requirements for which a particular material is intended.

2. They constitute a standard for measuring and checking up on materials as supplied. Such checking insures against delay and waste in fabricating plants which would occur with improper materials.

3. They are invaluable to the large consumer who commonly draws his material from several sources of supply. Their proper application in such cases insures that materials from different sources will be of uniform and suitable quality.

4. They promote the highest and best use of materials for each particular purpose.

5. They open a field of fair competition.

Taking up these five points in order, it is obvious that when a purchaser orders materials to a specification, whether it be his own, the manufacturer's, or those prepared by a technical society such as this, he has studied his requirements and concluded what materials are most suitable for his purpose. In ordering to specification, he benefits from all the research, experimental, and development work of which the specification is the final summary. The question may be asked, "Why so many sources for specifications; why not buy to the manufacturer's specification?" The answer to the latter part of the question is that this is frequently done; and to the first part, the answer is that the individual manufacturer's specification commonly represents the product which he can most conveniently produce. The manufacturer's specification is valuable as a guide to the trade, though it may not precisely comply with the requirements of the buyer. Specifications supplied by an organization such as this have a greater value because they represent the results of the composite effort of the various interests making up the trade as a whole. No doubt in many cases the specifications of this Society are compromises, but in all cases they are reliable and are a valuable guide to con-

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sumers. But many users have problems of their own, necessitating studies and investigations which may indicate certain modifications or deviations from standard specifications. The usual procedure in such cases is to formulate, on the substantial foundation already laid, the user's own specifications. As experience shows the way, he revises his specifications and keeps them up to date. The thought, study, and compilation of experience incident to this process must inevitably be of value alike to the manufacturer, the user, and the industry as awhole.

Costly Delays Prevented

As to my second point, that specifications constitute a standard, a yardstick, for checking up on materials. All products of one industry, as they become the materials of another, must be carefully checked. The user of steel must know that the material supplied to him is precisely what he wants so that it can be put into production without hitch or hesitation. If an error is discovered after production starts, the result will be a shop tie-up, with machines idle and production schedule disjointed until replacement is made. With improper material, a costly amount of scrap must result. Without specifications there are too many chances for something of this sort to go wrong. The purchaser may leave the matter of specification to the producer, who will do his best to supply precisely what is wanted, for in such cases he commonly guarantees his product. But something may go wrong either through lack of complete understanding or through error in the producing plant. In that event the user, not having ordered to specification, must rely on the manufacturer and has no means of checking the material before starting production. Improper material will cause delay and expense to the user, because, while the manufacturer replaces defective material, he does not stand the consequent expense incidental to delay. In referring to improper material, I may, by way of illustration, refer to such items as sheets and plates. These may be perfectly proper for certain uses, but undesirable for others. One user may emphasize strength, another ductility for cold pressing steel; yet another may require a special surface finish and uniform thickness. Again, in forging steel, one user may require the maximum degree of ductility for materials subject to shocks; another may need the maximum strength where stiffness is important; and yet another may find that the cheapest grade of material will answer his purpose, and that to use anything more expensive would add to his cost without in any wise improving his product. A specification to cover the precise requirements is the best and only assurance of obtaining entirely suitable material.

Taking up my third point, namely, that the proper use of specifications insures uniform quality of materials from different sources, it must be apparent that specifications are of particular importance. A user of steel may require deliveries at widely separated localities but of absolutely uniform quality. If, for example, we require steel wheels delivered at the Atlantic Seaboard, we do not order them from Chicago; yet we must be sure that wheels, from whatever source, shall conform to a rigidly fixed and uniform standard of quality. Both safety and economy in wheel service depend upon the closest adherence to the standards which have been developed and proved by service. It is highly improbable that anyone in a position of responsibility would purchase or use in passenger service, steel wheels from a variety of sources on the manufacturer's guarantees, without specification to insure uniformity. All manufacturers have not had the direct service experience so essential to safety and economy in wheel operation. Only when the cumulative experience of wheel-makers and wheel-users is embodied in a specification, can uniformity be insured among wheels drawn from a variety of sources.

I have said that specifications promote the highest and best use of materials. To this end, of course, a specification fully outlining the requirements is essential. The user from his experience with various grades is in excellent position to tell what grade of material will answer his purpose. There comes a time when special analysis and thought on the most economic use of materials is of first importance. Thus we may ask, "Are we getting all we can out of carbon steel? Can or should alloy steel be substituted?" In asking these questions we may have in mind considerations of strength, or safety, or of economy. When it comes to the soundest economic use of materials, the employment of specification in inquiries for material not infrequently leads to helpful suggestions from manufacturers. Their experience may have enabled them to suggest certain changes in specifications through which costs may be reduced. Thus the highest and best results economically will be obtained from sheet steel when no useless finishing labor is expended on it. A high degree of finish should be used only where it is essential; plain rolled mill finish should be used where it will answer as well. At times the highest and best use of sheet steel may justify the use of a costlier alloy product; and the principle of best use is applicable to other varieties of steel. But as to all steels, and all uses of them, it is a safe generalization that the highest and best use will be promoted by a full knowledge of the possibilities of the product as embodied in complete specifications.

Finally, I come to my proposition that the

use of specifications opens a field of fair competition. If it is true that competition is the life of trade, then it seems to me equally true that only by the use of specifications can a fair competitive field be insured. How else can a user make known his precise requirements to competing manufacturers in such a way as to insure that they will all have precisely the same understanding of his needs. It simply cannot be done. To use steel wheels once more as an illustration, I may note that wheels are a highly competitive product; but they are such, only because of the use of specifications. If any steel of special quality is needed, a specification showing the requirement immediately opens up a competitive field.

In conclusion, as one of those who in the workaday processes of industry have learned how helpful is the work done by such organizations as the American Society for Testing Materials, I cannot take my leave without a word in acknowledgment of my own debt. The activities of this Society have accomplished much in committing the country's industries to policies, programs, and methods which are in the best sense cooperative. They make for the larger interests of both manufacturers and users of all our products. By just such processes, I am sure, we shall continue to bring into American industry an efficiency which will insure the fullest benefits from increasing standardization, while avoiding any tendency to decrease initiative, discourage inventiveness, or atrophy that play of the imagination which is at last the very essence of inspiration for progress.

Welded Chain Industry to Identify Simplified Lines

All of the manufacturers of welded chain who have accepted simplified practice recommendation No. 100–29 have recently expressed their intention to identify the simplified lines in their new catalogues and trade lists, according to an announcement by the division of simplified practice of the National Bureau of Standards.

This plan is designed to assist buyers in maintaining close adherence to the waste elimination program. Cooperation by purchasing agents, architects, contractors, and other users greatly increases the benefits and economies possible through simplified practice. The welded chain industry is the first to record 100 per cent identification in the catalogues of accepter manufacturers.

The National Association of Purchasing Agents, the American Institute of Architects, the Associated General Contractors of America, the Chief Coordinator's Office of the U. S. Government, and other representative users of simplified commodities have for some time strongly urged that this policy be adopted by manufacturers. When the simplified items are so identified in trade literature, selection of the simplified items can be made without difficulty, and often much waste now incurred in checking other files and subsidiary records for this data is eliminated.

According to Alexander B. Galt, acting chief of the division of simplified practice, "there is every indication that manufacturers in other industries, who have cooperated in establishing simplified practice recommendations, will adopt this same policy of identification. This forward step indicates a realization by producers, distributors, and consumers of the value of cooperation in applying self-government to business."

Bureau of Standards Approves Commercial Standard for Plywood

The Bureau of Standards, United States Department of Commerce, has recently announced the approval of its proposed commercial standard for plywood, with the following scope:

> "These recommended standard grading rules cover plywood such as used in the furniture industry, for interior paneling, the cabinet trade and allied industries, made from the commonly used hardwoods and eastern red cedar. They specify the quality and construction for plywood of various species."

It is hoped that the adoption of these new standards by the plywood industry will end much of the confusion which heretofore existed between buyers and sellers.

Copies of the standard may be purchased by those interested through the ASA office or from the Superintendent of Documents, Government Printing Office, Washington, D. C., at five cents per copy.

New Member on Coal Classification Committee

The American Chemical Society has appointed Dr. H. H. Lowry as its representative on the Sectional Committee on Classification of Coal (M20), succeeding Professor S. W. Parr. Dr. Lowry is connected with the Coal Research Laboratory of the Carnegie Institute of Technology, Pittsburgh, Pennsylvania.

Underwriters Plan Inspection and Certification

The following items (the first on the Underwriters' Laboratories' new plan of inspection and certification, and the second one on automatic irons) are quoted from the August, 1931, issue of the NEMA Survey.

The Underwriters' Laboratories have just announced the establishment of a new plan of Inspection and Certification. At present it is being applied to structural clay tile only but it is so designed that it can be applied to other materials which may be listed by Underwriters' Laboratories. The purpose of this service is to assist the industry in maintaining a product of standard uniform quality and to supply such information as may be needed by regulatory and insurance rating bodies throughout the country concerning respective manufacturers of material certified.

Individual certificates of inspection are issued to cover specific lots of material and do not apply to the total production of a plant and it is not required that a manufacturer certificate his entire production in order to become eligible for listing. These certificates are countersigned by the Laboratories' representatives and can be transmitted to the owner or other interested persons as evidence that the material in question is of a uniform quality conforming to the Laboratories' requirements and as determined by factory and field operation.

This new plan of certification is not to be confused with the scheme that has been adopted in connection with automatic electric irons. The latter plan is one which involves the use of a printed tag carrying a simple statement made by the Underwriters' Laboratories referring to the merits of automatic irons; manufacturers of listed automatic irons are given the privilege of attaching such a tag to their product.

The technical committee of the Heating and Appliance Section reports that it has practically completed the Underwriters' Laboratories Standard for Automatic Irons; also, that it is investigating and studying the subject of a standard for heating pads.

The committee has about completed its work with Underwriters' Laboratories in the development of an identification tag for use on automatic irons which is to indicate that the type of automatic iron to which such tags are attached has been examined, tested, and listed by Underwriters' Laboratories. The identification tag bears this statement: "*Endorsement:* Electric Flat Irons Automatically Controlled to Prevent Over-Heating and Built to Our Standards Are a Valuable Protection against Fire in Their Use, Underwriters' Laboratories, Chicago." The reverse of this tag states: "*Samples* of This (Trade Name of Iron) *Iron* Catalogue No.—Have Been Tested by Us and Found to Conform to Our Standards, Issue No.—."

It is believed that the use of these tags will tend in a large degree to promote the use of the automatic irons which are recognized as presenting a minimum fire hazard.

Building Officials' Conference Will Discuss Code Maintenance

Building code development and enforcement will be stressed at the tenth annual meeting of the Pacific Coast Building Officials' Conference to be held at Berkeley, California, October 5 to 10, inclusive, with an attendance of city building inspectors, building material men, and others connected with the building industry. Discussions will deal with problems of the building inspector and committee work on code maintenance.

The most important achievement of the Pacific Coast Building Officials' Conference has been the preparation and publication of the Uniform Building Code for the use of interested cities. Since 1927 when the code was first published, it has been adopted in full as the building ordinance of 100 cities and towns and has been used by numerous others in part or as a basis for revising existing building laws.

Larger cities that have adopted the entire code include Alameda, Berkeley, Fresno, Long Beach, Pasadena, Riverside, Sacramento, San Bernardino, and San Jose, California; Everett and Olympia, Washington; Salem and Eugene, Oregon; Austin, Dallas, and Houston, Texas; Tucson, Arizona; Grand Forks, North Dakota; Helena, Montana; Albuquerque, New Mexico; Birmingham, Alabama; and Utica, New York.

At each annual convention, the code is reviewed and proposed changes discussed and recommended with the object of keeping the provisions correct, up-to-date, and unbiased in conformity with the latest and best modern practice and research findings.

New Zealand Standardizing Body

A national standardizing body is in process of organization in New Zealand, the preliminary organization going forward with the close cooperation of the executive of the Standards Association of Australia. Indications at present are that the new organization will follow British standards as closely as possible, modifying them, when necessary, to suit local conditions.